



**IN PRODUCTION** — Finishing touches are applied to some of the first production model Vistaphone picture telephones from Stromberg-Carlson.

## S-C Will Deliver 20 Vistaphone Systems For Instructing Deaf

Twenty Stromberg-Carlson Vistaphone units to be installed this month will form one of the largest picture-telephone installations in the world.

The units will be installed by Rochester Telephone Corporation at the National Technical Institute for the Deaf (NTID), a unique learning institution located on the campus of the Rochester Institute of Technology. Vistaphone units will be used by students, faculty and staff members at the institute for visual communication by means of sign language and lip-reading.

Since January of 1970, NTID has operated an experimental six-station Vistaphone system to study its effectiveness in helping the deaf communicate, and as a test of the units developed some five years ago by S-C engineers. The production units provide some important new features that will make the units more useful to the deaf.

The station units are equipped with wide-angle lenses made by Bausch & Lomb. This will make positioning less critical than with the experimental models. Fingerwheel controls permit zooming by electronic means to enlarge the image of the person being viewed. A flip-down mirror makes it possible to view drawings or small objects placed at the base of the instruments.

The greater sophistication of the

(Continued on Page 3)

## George Roos Named New IR Director at EB

George W. Roos has been named Director of Industrial Relations and Management Engineering at the Electric Boat Division.

He replaces D. C. Wilkens, who has retired.

Francis W. McNally has been appointed Manager of Labor Relations and Donald Carlson Manager of Personnel and Compensation. Both will report to Roos.

Roos, who joined the division in 1957, had been Director of Management Engineering since November, 1972. From 1968 to 1972 he was Manager of Change Control.

Roos is a 1952 graduate of Iona College in New Rochelle, N. Y. He is a four-year Navy veteran.

McNally had been Manager of Wage and Labor Relations at Stromberg-Carlson in Rochester since 1969. A 1961 graduate of Villanova University, he joined Stromberg-Carlson in 1966.

# Efforts of Employees Contribute to Increased GD Profits During 1972

Top officials of General Dynamics have reported to shareholders that 1972 was a year of accomplishment for thousands of employees in their steady efforts to make their company "the increasingly profitable company it can and should be."

Earnings were higher than in any year since 1968 as a result of employees "reducing costs and increasing efficiency and productivity," Chairman and Chief Executive Officer David S. Lewis and President Hilliard W. Paige said in the 1972 annual report.

Net earnings before extraordinary items totaled \$26,042,000—equal to \$2.47 per share, 26 percent greater than the previous year's \$1.96 a share. The increased earnings were achieved despite decreased sales, which in 1972 totaled \$1,539,390,000, compared with 1971 sales of \$1,868,801,000.

Lewis and Paige said accomplishments of 1972 "make us confident of future progress, in spite of the fact that we have some divisions still recording losses or inadequate earnings."

Among highlights cited were: reducing short-term borrowings by \$100 million; increasing working capital to \$182 million, the highest level since 1965; increasing the company's funded backlog by 33 percent; and winning a number of significant contracts.

These included Quincy Shipbuilding Division winning \$270 million in contracts for three huge Liquefied Natural Gas (LNG) tankers; Convair winning the competition to build two YF-16 low-cost Lightweight Fighter prototype aircraft for the Air Force; Electric Boat receiving design and development contracts from the Navy for the Trident nuclear submarine; and Electronics Division being awarded a key contract to provide airport surveillance radar systems for the Federal Aviation Administration.

The officials also cited enthusiastic customer acceptance of Stromberg-Carlson

(Continued on Page 3)

## Josephs Reports

### Engineering, Manufacturing Tasks for Lightweight Fighters Are on Schedule

Both engineering and manufacturing tasks on the first of two YF-16 Lightweight Fighter prototypes to be built by Convair-Fort Worth Operation are moving along on or ahead of schedule.

"By mid-March, we had released about 87 percent of structural drawings to manufacturing," said Lyman C. Josephs, Vice President-Program Director Lightweight Fighter Prototype Program. "And roughly two-thirds of the total engineering drawing releases had been completed."

Josephs said work on the forward fuselage of the first prototype was moving along ahead of schedule. Work was begun in late February and is slated for completion by mid-June. Assembly work on the aft fuselage began late in March.

"Detail parts for the wings and vertical fin are being manufactured on schedule," Josephs said. "Completion of the assembly fixture for these components is slated for April."

Josephs said work on a number of test components for the prototype is progressing satisfactorily and on schedule. A forward fuselage, which will be used in high-speed seat and canopy-ejection test runs at Holloman Air Force Base, N.M., is in final assembly and is scheduled for shipment in June.

Design verification tests of the first Lightweight Fighter's canopy enclosure will start in May.

The vertical fin test component, which has graphite composite skins, has been completed and is undergoing structural testing at Fort Worth.

Manufacturing is under way on the test horizontal stabilizer, which is also equipped with graphite composite skins. This component will be completed in June, and testing will start in July.

Josephs said these and other safety-of-flight tests must be completed before first flight.

After joining of the major components in June, the first prototype will move into primary assembly for instal-

lation of equipment, then into final assembly for installation of the engine and avionics equipment.

Rollout of the first prototype is scheduled for November in time for engine runs and preflight operations required prior to the first flight in January, 1974, at Edwards Air Force Base, Calif.

## Publication Resumes

With this issue, *GD World* is resuming publication.

The newspaper will be printed in St. Louis and distributed to employees throughout the company.

## M. C. Curtis, EB Deputy Manager, Named Corporate Vice President

M. C. Curtis, Deputy General Manager of Electric Boat Division, has been elected a Vice President of General Dynamics, David S. Lewis, Chairman and Chief Executive Officer, announced.

Curtis was appointed to his Electric Boat position Feb. 2.

"Curtis' election as a Corporate Vice President recognizes both his outstanding managerial abilities and the great importance of our work at Electric Boat in support of the Navy's nuclear submarine programs," Lewis said.

Electric Boat is the nation's leading producer of nuclear attack and missile submarines.

During his 22-year career with General Dynamics, Curtis has served as Divisional Vice President and General

Manager of the Fort Worth and San Diego operations of Convair and has held top manufacturing positions at Canadair Limited.

When named Deputy General Manager of Electric Boat, Curtis was Divisional Vice President and General Manager of the San Diego operation.

## EB to Overhaul Two Nuclear Submarines

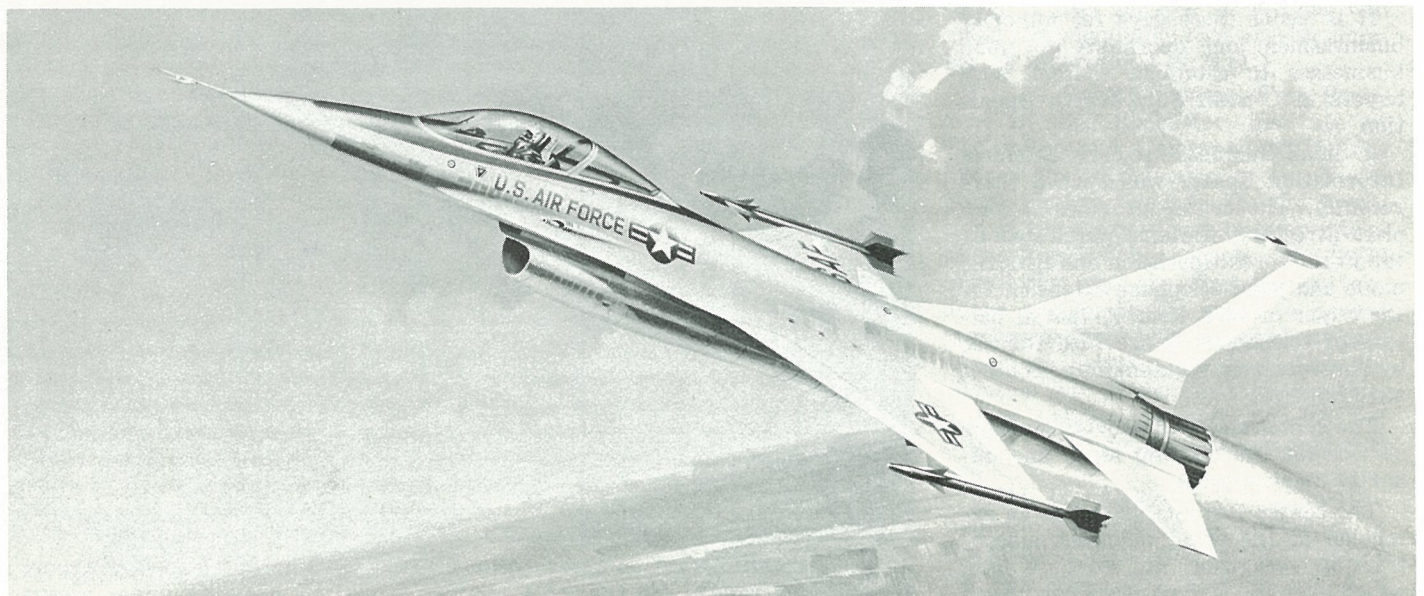
Two contracts totaling more than \$31 million have been awarded to Electric Boat Division for overhauling two nuclear submarines, the Defense Department announced.

Electric Boat received \$3,780,000 for preparation to overhaul, alter, and refuel the nuclear powered fleet ballistic missile submarine USS *Daniel Webster*.

A \$27,775,000 contract was awarded for overhauling, altering, and refueling the nuclear powered fleet ballistic missile submarine USS *Andrew Jackson*.



M. C. Curtis



**ON SCHEDULE** — Tasks on first YF-16 Lightweight Fighter prototype built at Fort Worth are progress-

ing on schedule. Assembly on aft fuselage is under way, and rollout of first prototype is set for November.

# Convair Readies 125th DC-10 Fuselage

Delivery of fuselage sections for the McDonnell Douglas DC-10 wide-bodied tri-jet by Convair-San Diego Operation is rapidly approaching 125 shipsets.

A major milestone was achieved in November when sections for Ship No. 100 rolled off the line and into the Super Guppy transport aircraft for delivery to the McDonnell Douglas Long Beach plant. Another highlight of the

program will be delivery of sections for Ship No. 125 in April.

John S. Bergstrom, DC-10 Program Manager for Convair, said: "We are delivering one shipset every four working days. At this pace, we anticipate that delivery of sections for the 125th airplane will be April 18."

McDonnell Douglas had firm orders for 181 airplanes and options for 45

others as of Feb. 9. Deliveries as of that date included 72 of the modern tri-jets to 27 airlines.

Convair builds the major portion of the 180-foot, wide-bodied fuselage. It consists of three sections: Section C/D, forward fuselage; Section E, center overwing section; and Section F/G, aft fuselage. When mated, these sections are 128 feet long.

DC-10 fuselage sections are delivered by the whale-shaped Super Guppy, a specially modified aircraft also used to transport major components of space hardware.

Bergstrom said a new version of the Guppy, Aero Spacelines 201-2, was at Lindbergh Field this month for a fit check of the fuselage section transporters. "Chances are that first sections, perhaps those for Ship No. 125, will be shipped via the new aircraft next month," Bergstrom said.

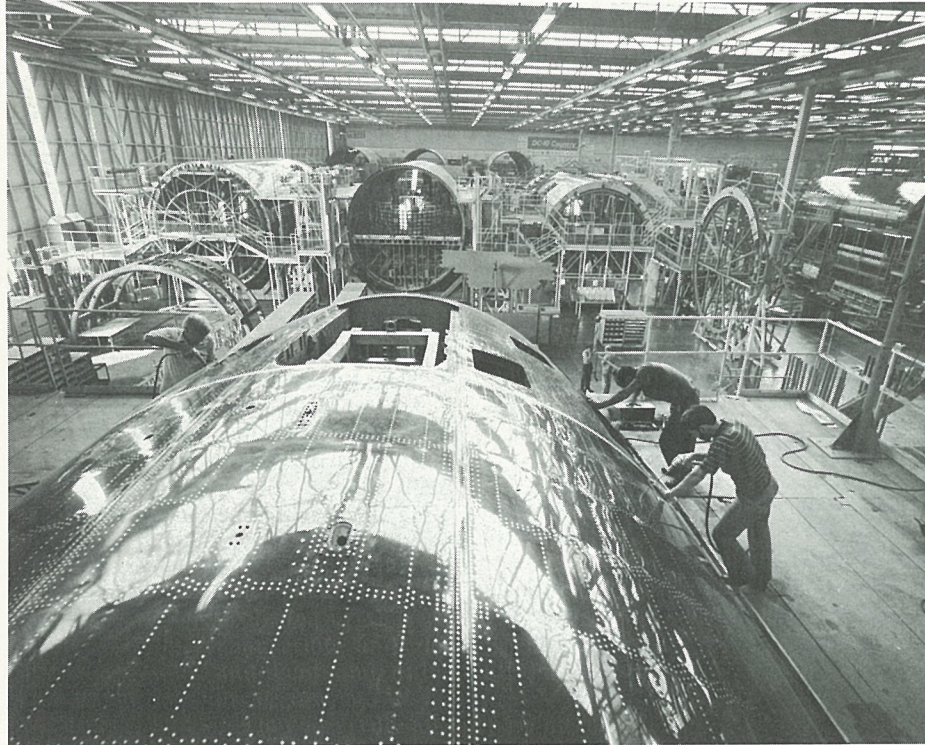
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## New DC-10 Models In Successful Flights

Two successful maiden flights of newer versions of the DC-10, for which Convair-San Diego builds main fuselage sections, were made recently from the McDonnell Douglas plant in Long Beach.

The first long-range Series 20 tri-jet transport completed a four-hour flight last month, while the first convertible freighter model lifted off early this month on its initial flight.

The DC-10CF (for convertible freighter) is the fourth major variation of the tri-jet to fly.



**DC-10 COUNTRY** — Fabrication of fuselage sections continues at brisk pace as evidenced by activity of C/D Section assembly line at the Lindbergh Field plant. Sections for Ship No. 125 are scheduled for delivery to McDonnell Douglas in April.

## ELECTRONICS IS DEVELOPING ASR-8, NEW AIRPORT SURVEILLANCE RADAR

A contract to design and build advanced new airport surveillance radars for the Federal Aviation Administration has been awarded by the Department of Transportation to the Electronics Division.

Under the \$18,174,437 funding, Electronics will build 37 of the systems, designated ASR-8. The new equipment incorporates numerous design features not found in radars presently in service. Among these is use of dual-beam antennas to extend low-angle coverage, enhance raw radar returns, improve aircraft detection and reduce ground clutter.

The ASR-8 also uses a klystron transmitter tube which virtually doubles the power output of the transmitter in comparison to other radar equipment. Other features are solid-state construction, integrated circuitry and modular construction to provide a high degree of reliability and reduce maintenance down-time.

According to A. W. French, Electronics Program Manager, ASR-8 development is currently in the

initial design phase that will run through early next year. That phase will be followed by development of the first manufacturing and test article.

Delivery of the radar receiver/transmitter units, associated equipment and spare parts is scheduled to begin in January, 1975, when the initial unit will be completed. A second unit will be completed four months later, with the remaining units delivered at a rate of two a month.

Of the 37 systems ordered, 33 are slated for installation at civil airports and two will go to the Defense Department for use at military installations. Airports serving Detroit, Seattle, Dallas, Pittsburgh, Cleveland, Minneapolis and Miami are already scheduled to receive the equipment.

One ASR-8 unit will be delivered to the FAA Academy at Oklahoma City for training maintenance personnel. Another will go to the FAA's National Aviation Facilities Experimental Center at Atlantic City, N. J., for research and development studies.

## Center Established for Minority Businessmen

It is easier these days for minority businessmen and operators of small businesses to establish contact with buyers at Convair-Fort Worth Operation.

A Small Business-Minority Business Information Center was opened there recently. The center provides a complete directory of items purchased by the Fort Worth Operation and lists the name and plant telephone extension for the buyer of each item. A special battery of telephones is provided for use by businessmen establishing contact with buyers.

The center also will provide message service for the visiting small and minority businessmen.

The center was established as an extension of the small business subcontracting program at Fort Worth, which over the last 10 years has placed orders in excess of \$550 million with small firms.

## Royalty-Free License Is Issued to Former Employee of Pomona

General Dynamics has issued a royalty-free license to a former employee for a communication system he designed while working at Pomona Division.

The license was issued to President Alphonse Bush, of Microwatts, Inc., a minority-owned company based in Inglewood, Calif.

Bush was an electronics engineer at Pomona from 1958 to 1962. During this time he and a fellow employee, I. S. Wernick, invented the point-to-point communication system, which has applications in the field of air traffic control.

The invention consists of a versatile antenna array with elements which can be selected to beam-ster a signal while remaining in a stationary position.

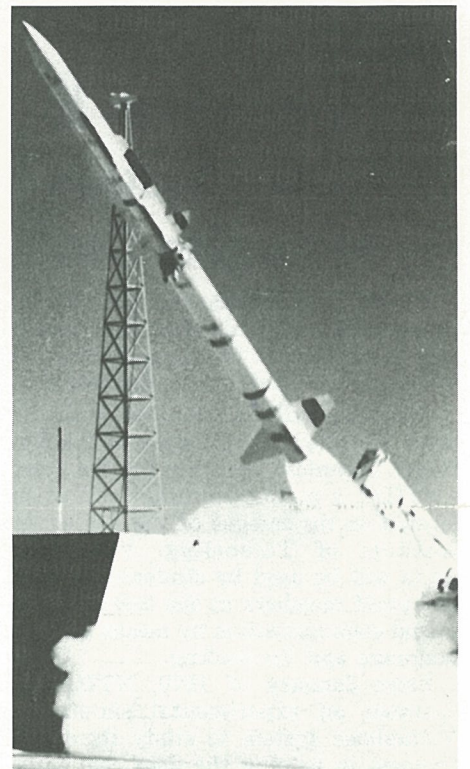
General Dynamics was awarded a U. S. patent for the invention in 1965. The company will retain its rights to the patent, but will not claim royalties to which it normally would be entitled on sales made by Microwatts, Inc.

## Standard Missile-2 Highly Successful in Three Test Firings

Standard Missile-2, outgrowth of a development program begun last year at Pomona Division, has given every indication that it will become a capable replacement for Standard Missile-1 and is planned for use in the Navy's Aegis Fleet Air Defense weapon system.

Since award of a \$2.4 million development contract last year, SM-2 has undergone three successful test firings, with a fourth to occur soon. The initial two shots validated the inertial reference system, which is the heart of the midcourse guidance mode. The first guided flight late last year successfully intercepted a target drone which was flying at transonic speed.

R. M. Kemp, Pomona SM-2 Program Director, said significance of the guided flight goes beyond successful accomplishment of the specific mission. "It establishes a new missile concept that provides for significant near-term performance improvement and long-term performance growth as the weapon for the Aegis and Terrier/Tartar systems," he said.



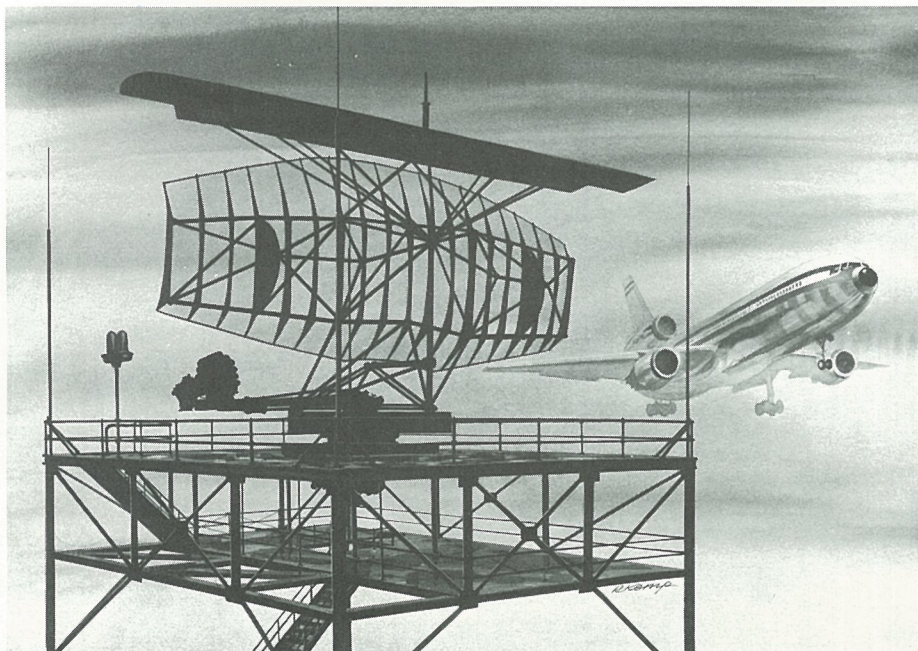
**GUIDED FLIGHT** — Pomona-built Standard Missile-2 is shown at launch on its first guided flight. The missile successfully intercepted target drone over White Sands Missile Range.

SM-2, a third-generation surface-to-air missile, incorporated all of the guidance modes contemplated for the operational weapon. During the flight phase, the missile executed all maneuvers as commanded by the ground station, utilized its midcourse guidance capability for the intermediate phase, and properly transitioned to terminal guidance.

The first two firings to demonstrate the capability of the strap-down reference unit were equally acclaimed, since previous applications of this nature had been restricted generally to ballistic missiles.

The missile flights were controlled by the USS *Desert Ship*, manned by a Navy crew from the Naval Ordnance Missile Test Facility at the White Sands Missile Range.

The SM-2 program is managed by the Naval Ordnance Systems Command.



**ADVANCED RADAR** — Electronics Division will build 37 ASR-8 airport surveillance radars for the FAA similar to artist's drawing under recent contract award. Program is currently in design stage, with first units slated for delivery in early 1975.

## SM-2 Goes 'Air Mail'

SM-2 rounds test-fired at White Sands Missile Range are going by "air" in more ways than one. Each has had an uncanceled U. S. Air Mail stamp affixed prior to launch, indicating the "bird" is ready to fire.

The "air mail" authorization was conceived by Pomona's quality assurance department and represents QA's "stamp of approval" for ready to fire.

## 'Tillie Lykes,' Final Seabee, Is Delivered By Quincy Division

*Tillie Lykes*, the last of three Seabees built by the Quincy Shipbuilding Division, has been formally delivered to Lykes Bros. Steamship Co.

She will go into immediate service between Galveston, New Orleans and Northern European ports, joining her sister ships, *Doctor Lykes* and *Almeria Lykes*, already in service.

Bold in concept and design, the Seabees are regarded by marine industry observers as the most flexible and economical merchant ships ever planned. Their versatility encompasses both commercial and military applications, and cargoes ranging from liquids to massive structures such as floating cranes and oil drilling rigs.

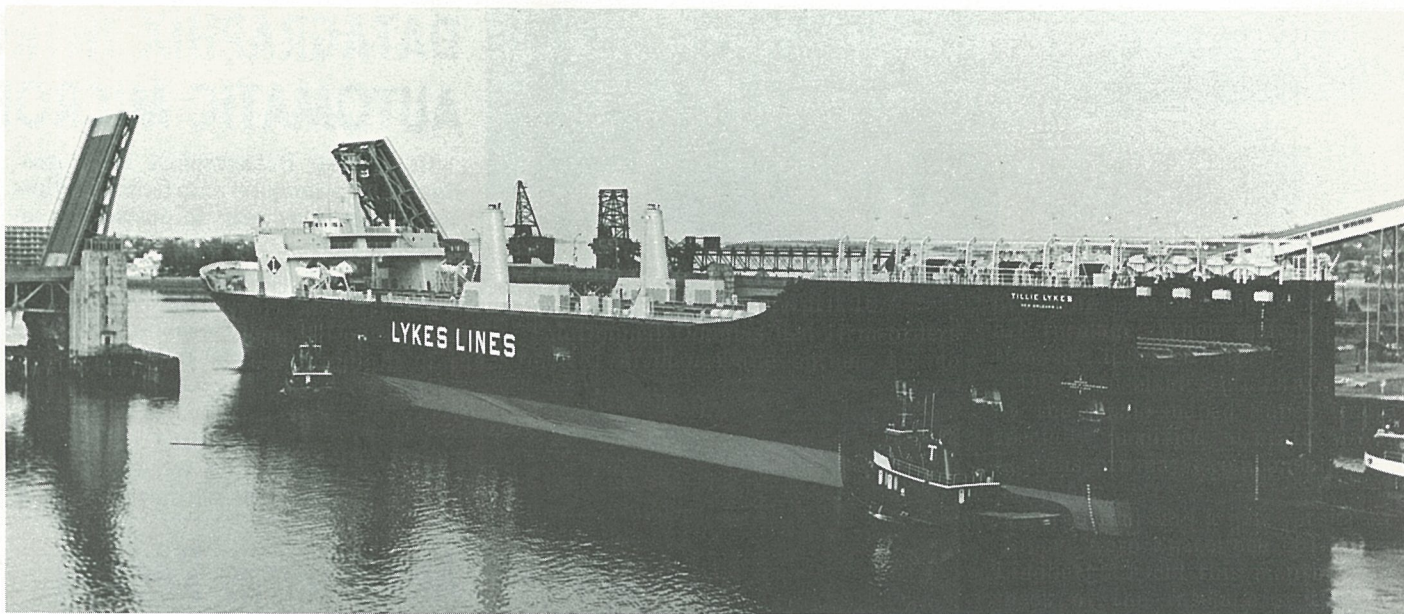
Using a unique barge-cargo handling system that is considered superior to any now in existence, the Seabees are expected to give increased impetus to the revitalization of the United States merchant fleet.

The Seabee has a significant advantage over conventional ships in that she is not required to enter crowded inner ports. The ship can anchor in any protected offshore area, avoiding port congestion and docking limitations, and load and unload all her barges in as few as 12 hours.

They are truly all-purpose merchantmen, able to carry a variety of dry and liquid cargoes in barges, containers, and storage tanks, or to handle vehicles in a roll-on/roll-off mode.

Because of her design and multiple missions, the Seabee has impressive vital statistics. She measures 874 feet in length—equivalent to three city blocks—and has a beam of 106 feet, allowing transit through the Panama Canal. Her power plant of 36,000 shaft horsepower will make her one of the most powerful single screw merchant ships on the sea.

*Tillie Lykes* will carry 38 barges containing 24,500 long tons of cargo. If desired, the cargo space can be used to carry 1,784 containers, roll-on/roll-off vehicles or unitized loads.



**FINAL SEABEE** — 'Tillie Lykes,' last of three unique barge-cargo ships built by Quincy Shipbuilding Division, was formally delivered in ceremonies recently.

'Tillie Lykes' will ply waters between Galveston, New Orleans and Northern European ports. Sister ships, 'Doctor Lykes,' 'Almeria Lykes' are already in service.

## John Lemon Named Internal Audit Head

John G. Lemon has been named Director of Internal Audit for General Dynamics, David S. Lewis, Chairman and Chief Executive Officer, announced.



**John G. Lemon**

Settlements, a position he held until being named to his new post.

Immediately prior to joining General Dynamics, he was Director of Financial Planning at Martin Marietta Corporation's Aerospace Group headquarters in Baltimore, where he also had served as Director of Overhead Budgets and Evaluation.

He graduated from Johns Hopkins University in 1951.

Lemon will be responsible for all internal auditing throughout the corporation.

He joined General Dynamics in 1969 as Corporate Director of Government Contract

## Efforts of Employees Contribute to Improved GD Profits During 1972

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Carlson's new CROSSREED electronic telephone switching systems. The subsidiary had record sales of \$252 million in 1972, and its backlog at year-end was up 54 percent for an all-time record.

"Our Marine operations are in the strongest position in history," the officials said. They emphasized that the new contracts received by Quincy and Electric Boat "provide potential for greatly increased sales and earnings for the rest of this decade." The officials said they believe there is "good potential for sizeable production contracts" on the YF-16 Lightweight Fighter prototype—the first contract for an all-new combat aircraft for Convair in 10 years. They reported that production will continue at a slow rate through 1974 on the F-111, which performed brilliantly in Southeast Asia.

Sales from General Dynamics' commercial operations increased nearly 8.3 percent during the year to a new all-time high of \$543 million.

Earning contributions from Material Service Corp., Marblehead Lime Co. and the Freeman and United Electric Coal companies continued to be strong, with "good prospects for future earnings growth."

The Electronics Division won the competition for the Federal Aviation Administration's new ASR-8 airport surveillance radar system. "This is a breakthrough into a new product line for our people," the officials said, "and has real profit potential for the future."

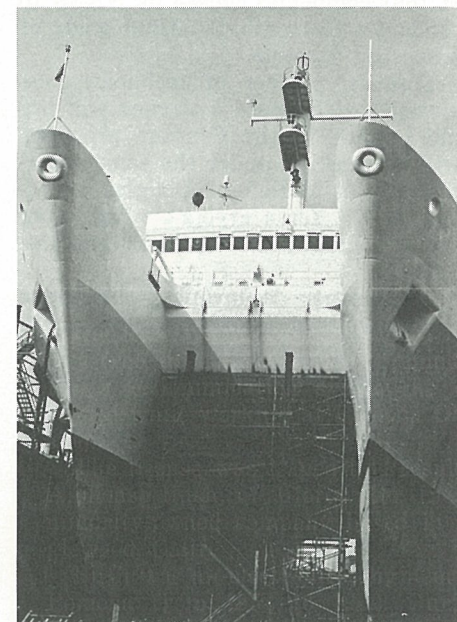
At Convair-San Diego Operation the DC-10 fuselage production program under subcontract from McDonnell Douglas continued on schedule. Officials felt the program would be a source of steady earnings for years to come.

Production of Atlas and Centaur space boosters at San Diego continued to provide steady earnings.

Canadair Limited had improved earnings in 1972 and acquired new

firm contracts for trainer versions of the CF-5 fighter aircraft and for CL-215 water bombers.

Pomona's earnings for 1972 were its highest in five years. The officials said Pomona was "one of the best and most creative organizations in the tactical missile and armament fields" and prospects for continued earnings growth are good.



**CATAMARAN** — Navy's twin-hulled 'USNS Hayes' is undergoing overhaul and alterations at Quincy. The 3,080-ton oceanographic research vessel arrived in January and work is scheduled for completion in May. The 246-foot catamaran is operated by the Military Sealift Command for the Office of Naval Research.

## Convair Awarded Study Contract For Navy's New V/STOL Aircraft

Convair-San Diego Operation has been awarded a \$249,000 contract to study engine/aircraft relationships for the U. S. Navy's V/STOL fighter/attack prototype aircraft program.

The award was made after the General Dynamics design was selected for further study as part of the Navy's

V/STOL prototype program. Convair program manager is W. A. Shryock.

The supersonic aircraft has vertical or short takeoff and landing capability for potential use with the proposed Sea Control Ship and other applications requiring high-performance V/STOL operation. V/STOL operation is obtained by using lift plus lift/cruise propulsion techniques which have been proven on other aircraft.

The design includes a controllable canard forward of the wing which provides unique maneuverability and control advantages. The combination of the canard and delta wing offers high performance for deck-launched intercept missions, air-to-air combat, and air-to-surface surveillance and attack missions.



**LIFTOFF** — Artist's concept shows new General Dynamics V/STOL fighter/attack aircraft lifting off carrier deck. Convair Aerospace Division is performing engine/aircraft relationship study for Navy.

## Savings Plans Pay Nearly \$20 Million

A total of 13,128 General Dynamics employees recently received \$19,769,625 in distributions for the Plan Year 1969 from their participation in the company's Savings and Stock Investment Plans.

This total represented just under 55 percent of the total number of participants who had Plan Year 1969 contributions.

The balance of participants with 1969 accounts elected to defer distribution, and their vested monies will remain invested in the plan.

The amount distributed consisted of \$17,046,084 in cash and 107,331 shares of General Dynamics common stock valued at \$2,723,541.

## General Dynamics World

Published by General Dynamics Corporation, Pierre Laclede Center, St. Louis, Mo. 63105, under the direction of the Public Affairs Department.

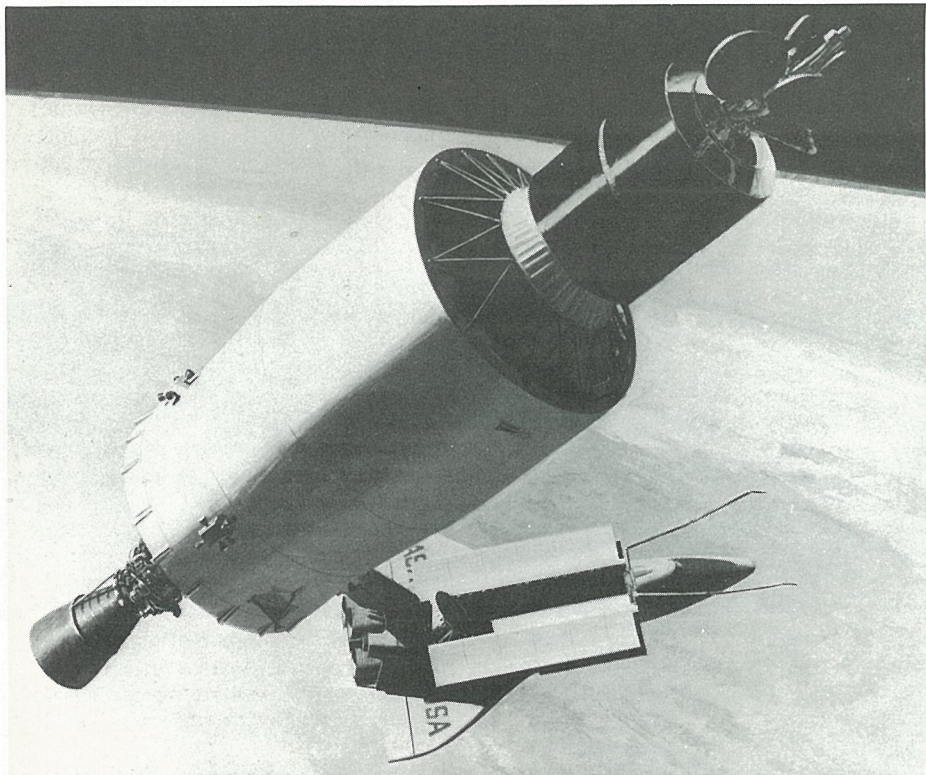
## S-C Will Deliver 20 Vistaphone Systems

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production units will make them much easier to use, and the 20 stations will make them available to a greater number of individuals at NTID.

Dr. D. Robert Frisina, Vice President of the Rochester Institute of Technology and director of NTID, has likened the introduction of the Vistaphone picture telephone to the invention of the conventional voice-only telephone for hearing people. The 1970 installation was the first known telephone system in the world to permit spontaneous and private telephone conversations between the deaf. This application has proven that picture telephones are not a mere novelty but rather an important communication tool.

NTID is a federally funded institution for post-secondary education of the deaf. It is the only technical school for the deaf integrated within a hearing campus. Deaf and hearing students often attend the same classes, receiving education of equal quality.



**SPACE TUG** — Artist's concept shows space tug vehicle in foreground, after deployment from the cargo bay of space shuttle orbiter below. Role of the space tug is to carry payload, such as the satellite shown here on nose of space tug, into deeper space.

### 'Cryogenic' Tug

## NASA Selects Convair for 10-Month Space Tug Study

Convair-San Diego Operation is one of four companies chosen by NASA to conduct a 10-month, \$750,000 study of space tug systems.

Convair, pioneer of technology associated with liquid hydrogen and liquid oxygen in the Centaur program, will be working under the same specifications as McDonnell Douglas Astronautics Co. for a cryogenic tug using liquid hydrogen and liquid oxygen propellants.

Two other companies, Grumman Aerospace and Martin Marietta, will conduct similar parallel studies of a tug which would use Earth-storable propellants.

The Convair space tug team under Davey Jones, Orbit-to-Orbit Shuttle/Tug Program Manager, was at Marshall Space Flight Center, Huntsville, Ala., recently for orientation meetings

with NASA personnel and presentation of the Convair study plan.

The space-tug will operate in conjunction with the space shuttle and in effect will become the third stage of the shuttle for some missions.

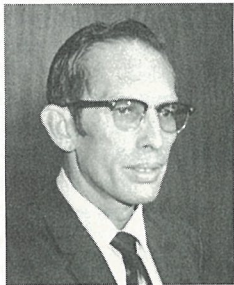
Among the uses planned for the tug are transfer of satellites from orbit-to-orbit in near-Earth space and launch and retrieval of satellites between low orbits and higher-energy orbits.

In each mission the tug would be ground-based. It would be fueled on the ground, launched from the shuttle in low Earth orbit, recaptured by the shuttle at the end of its mission and returned to Earth for further use.

Carl Peters is Convair Study Manager for Space Tug Systems and F. E. Jarlett is Deputy Study Manager.

## VAN ZEE IS NAMED ENGINEER OF YEAR

Marion E. Van Zee, a Design Specialist in the advanced systems dynamics group, has been selected Engineer of the Year for 1972 at Pomona Division.



The award is presented to the company engineer who makes the most significant individual contribution to product design during the calendar year.

Van Zee received the award for his work in passive electro-optical guidance, which has extended the operational capability of anti-aircraft homing missiles produced by Pomona.

During his nine years at Pomona, Van Zee has specialized in missile guidance systems including functional design and performance evaluation.

Van Zee received bachelor of science and master of science degrees from the University of Wyoming.

### Sub Named 'Groton'

The third of seven 688-class attack submarines to be built by Electric Boat Division will be named after the City of Groton, Conn.

More than 150 submarines have been built in Groton, in which Electric Boat is located.

Keels for two of the 688-class submarines have already been laid. The earlier two ships were also named after cities—the *Philadelphia* and the *Omaha*.

## DATAGRAPHIX INTRODUCES MODEL 73 AUTOMATIC MICROFICHE DUPLICATOR

Stromberg DatagraphiX has introduced an automatic cut-fiche duplicator which is as easy to operate as an office copier.

Designated DatagraphiX Model 73, the duplicator is a readily movable, free-standing unit featuring a unique two-station turntable into which the master microfiche is loaded.

Once the Model 73 turntable is loaded, the operator need only select the number of copies required (from one to 99) and press the start button. A

second master microfiche can be loaded while the first is being duplicated.

The unit produces high-quality, cut-card duplicates from roll film at a throughput rate of up to 1,000 per hour. Duplicates are the same size as the master and there is virtually no wasted film.

The Model 73 is as easy to load with copy film as it is to operate. Loading and threading operations for a 1,000-foot roll of film takes less than 30 seconds.



**FICHE DUPLICATOR** — DatagraphiX Secretary Carol Anderson adjusts copy selector of Model 73 prior to loading another microfiche master in two-station turntable.

## Army Terms Redeye Fly-Before-Buy Tests 'Unqualified Success'

The U. S. Army has completed its first series of fly-before-buy demonstration firings of Pomona's Redeye, a shoulder-fired, heat-seeking guided missile.

Army officials termed the Redeye firings—made by military and government personnel—an “unqualified success.” A majority of the firings resulted in direct hits on the small tow targets, with overall results exceeding acceptance requirements.

The current, or seventh, Redeye production contract at the Pomona Division is among the first issued by the Army containing a fly-before-buy demonstration clause.

To meet the acceptance requirements, the Redeye missiles used for the firing demonstrations are selected at random from each production lot.

The first demonstrations were conducted at the White Sands Missile Range, N. M., and at Fort Bliss, Tex., home of the Army Redeye School, where newly trained gunners fire their first Redeyes.

Redeye is a self-contained weapon system, designed for use by frontline troops as a defense against low-flying aircraft. It is carried and handled in the same way as an infantry rifle.

## SUPPLIERS CITED FOR GOOD WORK

The Electronics Division recently honored seven firms as “outstanding suppliers” in ceremonies at the Kearny Mesa plant.

J. R. Iverson, Vice President and General Manager of the division, made the presentation to representatives of Allen-Bradley Co., J. F. D. Electronics Corp., Plastic Center, Shamrock Wire, A. A. Engineering Corp., Rubbercraft Corp. and A. W. Haydon Products Division of North American Philips Controls Corp.

The firms were singled out for recognition as part of the Electronics Division's Crusade for Excellence, a Zero Defects program to encourage quality workmanship and eliminate costly defects in basic materials and end products.

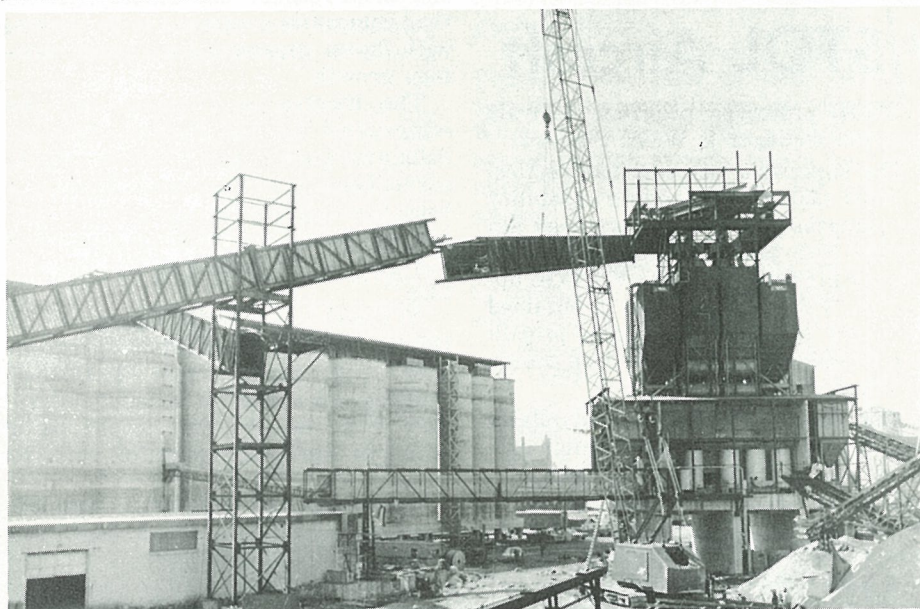
To qualify for the award, a supplier must provide defect-free products during a six-month period. In addition, other criteria such as delivery schedules, costs, volume and part complexity are also factors in the selection process.

## Pearce Named S-C's Initial IEEE 'Fellow'

J. Gordon Pearce, Manager of Systems Planning for Stromberg-Carlson, has been elected a fellow in the Institute of Electrical and Electronics Engineers (IEEE). He is the first S-C engineer to be honored with a fellow membership in the IEEE.

The IEEE cited Pearce for his “outstanding contributions to electronic switching.” Pearce has been responsible for developing concepts that guided the development of Stromberg-Carlson's highly popular CROSSREED electronic switching system.

He has been active in IEEE telecommunications committees on a national and international scale and is a prolific author of technical papers and articles on electronic switching. A number of his articles on electronic switching have been combined, resulting in three books. A fourth book is now in progress.



**GOING UP** — Huge crane lifts steel gallery into place during construction at Material Service Corporation's Redi-Mix Yard No. 1 in Chicago. The gallery, which will be enclosed, will carry aggregates from silos at left to mixing plant, shown at right. The yard will be the most modern in the country.

## First of 24 F-111Cs Delivered To RAAF in Ceremony at FW

The Royal Australian Air Force took delivery of the first of its 24 F-111C strike aircraft March 15 in ceremonies at Convair-Fort Worth Operation.

Australia contracted for the F-111Cs on a government-to-government basis with the United States, and F-111C No. 1 was delivered to the RAAF by the U.S. Air Force Systems Command.

The 24 F-111Cs will be flown to Australia in groups of six from McClellan Air Force Base, Calif., by RAAF crews who have been trained by the U.S. Tactical Air Command at

Nellis Air Force Base, Nev.

The first group of six aircraft is scheduled to arrive at RAAF Base Amberley near Brisbane on June 1 for operation by No. 82 Bomber Wing. The final group of six F-111Cs will arrive at Amberley about Dec. 1.

The F-111C is similar to U.S. tactical fighter bomber versions of the F-111, except for wider span wings to give it extra range and strengthened landing gear to permit operation at a higher gross weight.

# Convair Looks Back on Half Century of Progress

A half century has passed since a former Army flyer consolidated the assets of two ailing aircraft companies to establish the firm that in time became the Convair Aerospace Division of General Dynamics.

Maj. Reuben H. Fleet called his company Consolidated Aircraft Corp. when he chartered it on May 29, 1923.

He purchased the training aircraft designs of Dayton-Wright from Gen-

eral Motors and set up shop in an East Greenwich, R. I., plant rented from Gallaudet Aircraft.

The following year the young company moved operations to Buffalo, N. Y., where it made its impact on the airplane industry with the introduction of the Husky trainer. By 1930, after having built more than 800 of the popular trainers for the Army and the Navy, Consolidated had firmly es-

tablished itself as a leader.

The Commodore flying boat was later unveiled, and an eight-passenger Fleetster made advances into the commercial market. The general acceptance of the flying boat as a military deterrent as well as a commercial carrier prompted Fleet to survey the country for a factory site in a city unhampered by snow and ice, having public airport and seaplane facilities,

and offering an adequate labor supply. He chose San Diego, and in October, 1935, more than 300 key people relocated with Fleet from Buffalo.

In San Diego, Consolidated began building Catalina and Coronado flying boats for the Navy, which necessitated facility expansion in 1937. (The company was to double its floor space 16½ times during the first six

(Continued on Page 4)

## General Dynamics World

Vol. 3, No. 3

43 81 17

GENERAL DYNAMICS CORPORATION

June 1973

### GD Has Option to Buy Interest in Air Cargo Firm

General Dynamics has guaranteed loans totaling \$23,667,000 to allow Federal Express Corp. of Little Rock, Ark., to buy 18 Falcon jet aircraft, and has an option to buy a controlling interest in Federal Express.

Federal Express now owns 15 Falcons which are in use in its parcel-delivery, freight-charter and airmail operations. After beginning opera-

tions in June, 1972, Federal Express now serves 25 cities with one-day, door-to-door service and has plans to expand to serve a total of 120 cities nationwide.

The additional 18 Falcons are being purchased from Pan American World Airways.

General Dynamics said its option to buy a controlling interest in Federal Express, which is certificated as a third-level carrier, is subject to approval of the Civil Aeronautics Board and is dependent on further analysis of Federal Express' operations and prospects.

Federal Express daily collects parcels in the cities it serves and flies them to Memphis, Tenn., for sorting by destination, then flies them to each route city.

### Three in New Posts At Stromberg-Carlson

Stromberg-Carlson has announced appointment of William L. Evans as director of engineering, Jay M. Farrar as vice president-operations, and Frank B. Kemper as plant manager-Sanford.

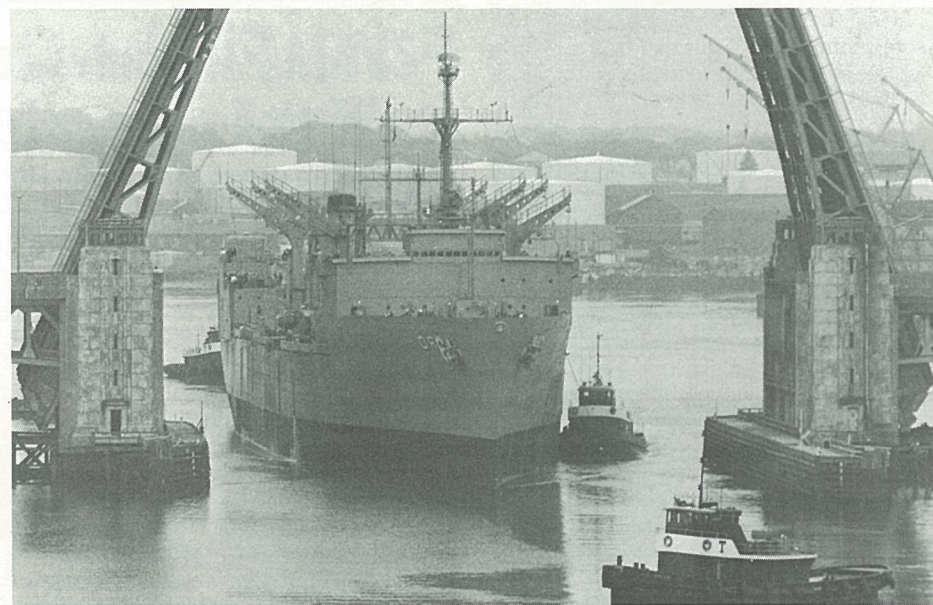
Evans joined S-C from Convair-Fort Worth, where he was manager of avionics systems. He joined General Dynamics in 1950 at Fort Worth and has held a variety of engineering supervision and management positions.

Evans received B.S. and M.S. degrees in electrical engineering from Texas A&M University.

Farrar joined S-C in 1972 as manager of Rochester electronic switching manufacturing operations and was later named director of Rochester operations. He had served previously for 16 years in a variety of production and program management positions at Convair-San Diego.

He received B. S. degrees in electrical engineering and business administration from Kansas State University and an M. S. degree in production management from San Diego State University.

Kemper joined S-C from General Dynamics' Electronics Division, where he was director of manufacturing at San Diego. He joined General Dynamics there in 1937 and held a variety of supervision and management positions until being assigned to Electronics in 1970. He is a Senior Member of the Institute of Electrical and Electronics Engineers and is a member of the electronics committee of the Aerospace Industries Association.



**SEA TRIALS** — The 37,000-ton Navy replenishment oiler *Kalamazoo* heads out to sea for the start of her builder's trials from the Quincy Shipbuilding Division. She is the sixth of her class to be built at Quincy and is scheduled for delivery soon.

### Corporate Earnings Up 44 Percent

General Dynamics Corporation reported its 1973 first-quarter earnings were 44 percent higher than last year's.

Chairman and Chief Executive Officer David S. Lewis said earnings for the quarter ending March 31 were \$7,366,000 on sales of \$398,033,000, equal to 70 cents per common share. This compares with 1972 first-quarter earnings of \$5,104,000, or 48 cents per share, on sales of \$382,288,000.

#### Director Elected

Shareholders at the company's annual meeting in St. Louis elected Robert F. Ellsworth to the board of directors, succeeding Stanley deJ. Osborne, who retired from the board after serving since 1970.

Ellsworth is president and chief executive officer of Lazard (N. Y.) International and a general partner of Lazard Freres and Co. of New York. He served in the U. S. House of Representatives from Kansas from 1961 to 1967, was an assistant to the President on the White House staff in 1969, and was ambassador and permanent representative of the U. S. to NATO (North Atlantic Treaty Organization) from 1969 to 1971.

#### Improved Year

Lewis told the shareholders "we expect that 1973 as a whole will be a much improved year for General Dynamics."

Commercial sales increased to \$543 million in 1972, Lewis said, and the company expects "that our commercial business will equal our government business in a very few years as our sales in both areas are increased."

Sales by S-C, the nation's leading independent telephone equipment manufacturer, "reached \$142 million in 1972 — a record high — and its backlog was up 54 percent to establish another record," he said. S-C's earnings are anticipated to reach "an all-time high in 1973," Lewis said.

Electric Boat has submitted proposals on the 11 additional 688-class attack submarines to be bought by the Navy, "and we hope to win a sizable part of this business to add to our seven-ship backlog of this class of ships," he said.

The Pomona Division, a leading producer of tactical missiles, had earnings in 1972 that "were the best in five years, and so far this year it is well ahead of last year's pace," he said.

Lewis said that both Convair locations produced increased earnings compared to the first quarter of last year despite sales being down slightly at both locations.

"Fort Worth is turning in good earnings performance on the greatly reduced F-111 program as a result of the strenuous efforts of their people to reduce overhead and direct labor costs," Lewis said.

"Certainly San Diego's future appears to be bright, based on its steady and profitable space backlog and the excellent prospects for the DC-10," Lewis said.

#### Efforts Pay Off

He said the same is true of the Electronics Division, "where the strenuous efforts to reduce the sales deterioration of the past few years have resulted in the winning of several new contracts, the most significant of which is for the ASR-8 airport surveillance radar for the Federal Aviation Administration."

Lewis said the Material Service operations "continue to provide good present day earnings, coupled with a bright future." He said Marblehead Lime's output capacity has been increased 160 percent to 2.6 million tons annually, "and its sales have more than doubled." He said orders

are being received at a record pace by Asbestos Corp. and "we expect . . . sales will be up significantly for the year 1973."

The \$270 million in contracts for liquefied natural gas ships won by Quincy are particularly significant for two reasons, Lewis said. "One, Quincy will continue as a major operating division; and, two, these awards place us in the forefront of a new and growing market."

### Lauwereins Named Material Service VP For Total Operations

Morris A. Lauwereins has been named vice president for all operations of Material Service Corp., President Lester Crown announced.

Lauwereins formerly was vice president of the Redi-Mix Division of Material Service. He will report directly to Arnold Sobel, executive vice president of Material Service.

Lauwereins, a graduate of Purdue University in civil engineering in 1950, joined the company in 1954 as a quality control engineer. His new responsibilities will include the quarries, the sand and gravel plants, and marine operations, as well as the Redi-Mix Division.

He is a director of both the National and Mid-West Redi-Mixed Concrete Associations, a member of the executive committee and chairman of the environmental committee.

Material Service is the largest producer and distributor of aggregate products in the Chicago area, servicing the building industry through yards strategically located throughout the region.

### DC-10CFs Delivered

Overseas National Airways and Trans International Airlines have each taken delivery of a DC-10CF (convertible freighter), the first new-generation, wide-cabin jetliner built for either passenger or cargo service.

Convair-San Diego produces fuselages for all versions of the DC-10 for McDonnell Douglas. The DC-10CF fuselage is 19 feet in diameter and 182 feet long.

## Apprentice School at EB Enrolls First Women as Welder Trainees

The apprentice school at Electric Boat Division has enrolled four women—first in the school's 25-year history—to train as welders.

They are Linda Burgess, Donna Lewis, Joanne Manfredi and Jessie Robinson.

The four are scheduled to graduate from the apprentice school in two years, said Keith L. Reed, the school's supervisor. They will emerge as welders second class, and after six months be reviewed for possible promotion to welders first class.

All four of the new trainees express dislike for confinement of office work. And all four, in varying degrees, find it stimulating to fabricate heavy metal parts.

Miss Lewis finds welding to be "something new and exciting," while the skill "comes naturally" to Miss Burgess.

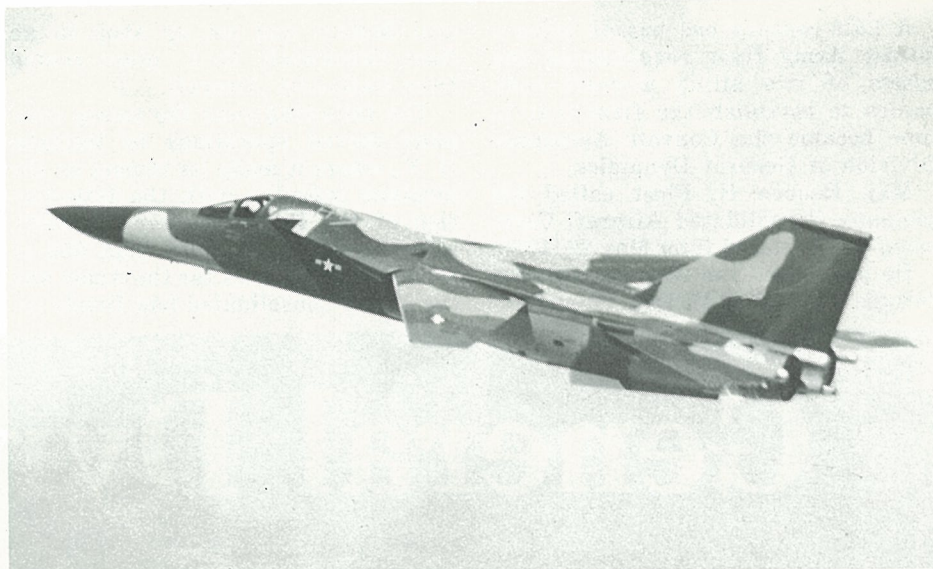
All four plan to complete their ap-

prenticeship and continue in their newly acquired trade.

Are the days of World War II's "Rosie the Riveter" returning to Electric Boat?

"Not yet," says shipyard placement supervisor Robert O. Brown. "At the moment it's just a little more than a trickle—perhaps four or five a week. Not every woman wants to work in the shipyard. But we offer it to those who show interest. So there are bound to be more, and some of them will go through the apprentice school."

Reed said the apprentice school was jointly established in 1948 by the company and the Metal Trades Council, principal shipyard bargaining agent.



**SUCCESSFUL TEST** — F-111E No. 1 makes low-speed, high-angle-of-attack flight during stall-inhibitor system test program at Edwards Air Force Base, Calif. A new takeoff and landing warning system was also tested.

## F-111 Flight-Control Innovations Pass Test

Convair-Fort Worth engineers have designed new features into the F-111 flight-control system to make the aircraft even safer and easier to fly.

These features are a stall-inhibitor system which automatically restrains the aircraft from going into a stall or spin condition, and a warning system which alerts the pilot of an incorrect configuration during landing or takeoff.

Fort Worth pilots successfully flight-tested the modifications during a two-month period at Fort Worth and Edwards Air Force Base, Calif.

"The stall-inhibitor system adds a new dimension of safety to the F-111," said R. P. Andrews, manager of flight test. "This system automatically limits the angle of attack so that it inhibits the airplane from going into a stall condition, regardless of the aircraft's speed."

"This gives the pilot an opportunity to pay more attention to conditions outside his cockpit, even at low speed and high-angle-of-attack conditions."

The warning system includes a horn which sounds when an F-111's

takeoff or landing configuration is incorrect, based on airspeed, altitude, wing position, flap setting, throttle setting, and angle of attack.

The modifications have also been evaluated by both Tactical Air Com-

mand and Strategic Air Command pilots at Edwards on F-111E No. 1.

"Based on their evaluation as to how valuable the improved capabilities will be under actual operational conditions, all F-111 flight-control systems may be updated to provide an even safer and more useful combat airplane," Andrews said.

"This was one of the most successful flight-test programs I've seen," he added. "Everything was on schedule, the equipment performed as expected, and the results obtained from the flight-test program correlated almost exactly with results from the flight simulator."

### F-111 Safest Fighter

The F-111 had a lower major accident rate at 250,000 hours of flight than any other Century series fighter.

When it reached 250,000 hours of flight in February, the F-111 had sustained 31 major accidents. By comparison, the F-106 had sustained 58 major accidents; the A-7, 58; F-4, 82; F-101, 86; F-102, 86; F-104, 127; and F-100, 183.

"A major accident is one in which the aircraft is either destroyed or requires more than 900 man-hours to repair," said W. T. Allen, project engineer for aerospace safety at Convair-Fort Worth.



**WELDING** — Donna Lewis is one of four women training to become welders in the apprentice school at Electric Boat Division.

## POMONA TO BUILD SSMs FOR NAVY

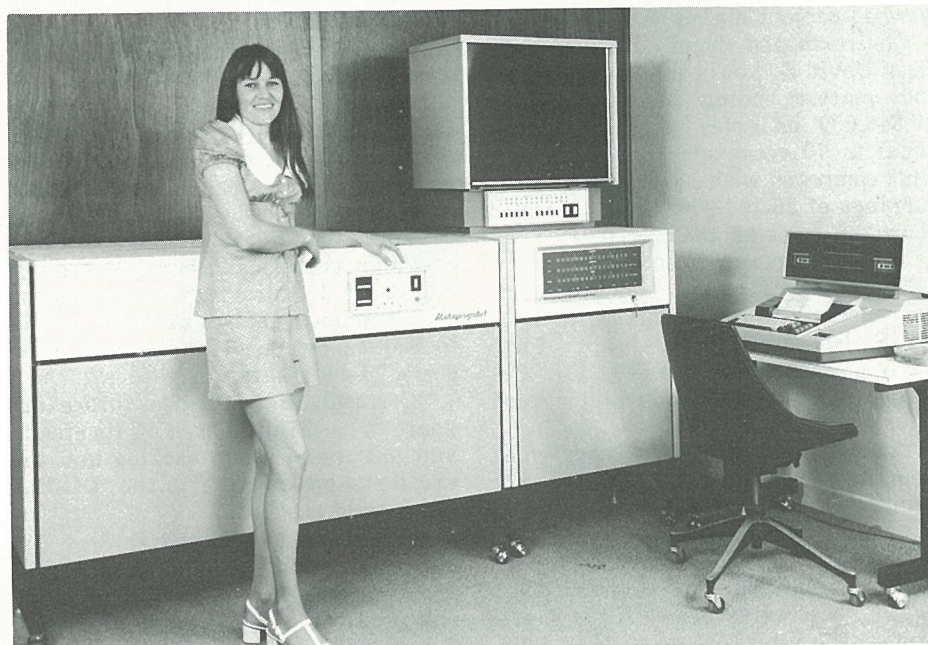
Pomona Division has received a \$1 million definitization of a previously awarded letter contract for the Standard ARM weapon with the combat-proven, antiradiation missile guidance system.

The funding covers production of a limited number of SSMs (surface-to-surface missile) for the Navy and marks the first time an operational air-to-surface weapon has been used in a surface-to-surface missile program.

The missiles are being fitted aboard the USS *Douglas* (PG-98) and the USS *Grand Rapids* (PG-100) for testing in the near future.

Launch from the combatants will be accomplished by utilizing a Pomona-designed and developed guided missile launch system designated GMLS Mark 32. It is the first operational General Dynamics' launch system deployed to ships of the fleet.

Two other PGs, USS *Antelope* (PG-86) and USS *Ready* (PG-87), were similarly equipped last year with the semiactive surface-to-surface Standard.



**SYSTEM 4500** — DatagraphiX unveiled new family of COM recorders at the International Micrographics Congress recently in London. Model 150, shown here with Judi Alonzo of DatagraphiX before shipment to London, drew considerable attention from European COM users.

## DatagraphiX System 4500 Draws 'Excellent Response' From Europe

A new family of computer-output-microfilm (COM) recorders called the System 4500 has been introduced into the European market by DatagraphiX International, Inc.

Fred Walz, director of international marketing for DatagraphiX, said the new series of COM recorders drew considerable attention and excellent response from European COM users during demonstrations at the International Micrographics Congress meeting May 22 at Grosvenor House in London, England.

Three models, each incorporating features aimed at ease of operation, high-quality output and low maintenance, are being offered in the initial System 4500.

Model 120 is an online COM recorder for direct interface to IBM 360/370 computers. Model 130 is an offline COM recorder that accepts phase-encoded and NRZ (nonreturn to zero) tapes from a variety of computers. Model 150, which was put through its paces at the congress, is an offline recorder with a minicomputer that supports complete data formatting and microfiche management from print tapes produced by a large number of general purpose computers.

All models use the new "all-magnetic" Charactron® Shaped Beam Tube to produce exceptionally high-quality characters with an intensity up to 12 times that of previous tubes.

## C. W. Schertz Garners Famed Knowles Award

C. W. Schertz, engineering staff specialist at Pomona Division, has received the American Ordnance Association's coveted Knowles Award in recognition of major technical contributions to U. S. armament progress.

The \$1,000 award was established in memory of Harvey C. Knowles, founder of the association's technical divisions. It was presented at the defense preparedness luncheon May 17 during the AOA annual meeting in Washington.

Schertz was cited for his efforts in perfecting the gun-aiming technique employed in the Phalanx close-in weapon system under development for the Navy by Pomona.

The technique electronically measures gun-aiming error to provide for continuous corrections. Schertz's efforts resulted in major advancements in ordnance technology in the use of electronic spotting and tracking methods and in the development of unique approaches in ammunition design.

In 1970 Schertz was chosen General Dynamics Engineer of the Year. He is a member of the Institute of Electrical and Electronics Engineers and the American Ordnance Association.

## Telephone Rework Increases at Camden

Stromberg-Carlson's Camden, Ark., plant is doing a booming business in refurbishing telephones for independent telephone companies.

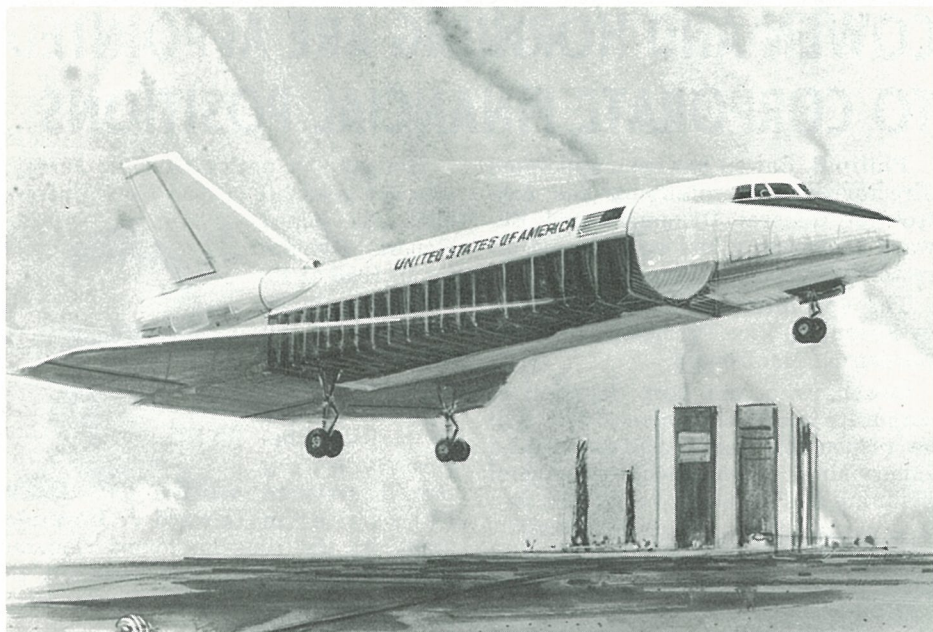
The Camden operation each week makes more than 1,000 used telephones almost new again, and customer acceptance of this service has been enthusiastic.

A company truck is dispatched from Camden each week to pick up instruments in need of repair and to deliver rebuilt instruments to customers.

This service has done nothing to dampen customer demand for new Stromberg-Carlson telephones. On the contrary, it has enhanced the S-C position, since telephone operating companies can now get full service from one company. New telephone orders increased by more than 25 percent in 1972.

## General Dynamics World

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**CONVAIR TASK** — Artist's drawing shows cutaway of space shuttle orbiter midfuselage section, which Convair-San Diego will design and fabricate for RI's Space Division.

### Preliminary Design

## Key Personnel from SD Start Phase 1 Effort for Shuttle Midfuselage at RI

A cadre of key personnel from Convair-San Diego are on-site at Rockwell International's Space Division in Downey, Calif., to carry out the Phase I effort on the space shuttle orbiter vehicle midfuselage subcontract awarded to Convair.

Convair and RI recently negotiated an approximately \$40 million contract for midfuselage sections which will be built by San Diego. Until that agreement is signed, Convair will continue working under a letter contract that authorizes initiation of midfuselage pre-design.

Jack Hurt, orbiter midfuselage program director for Convair, said the initial engineering group of 30, including representatives from production and quality control, began their preliminary design tasks at Downey May 1. The engineering group is ex-

pected to increase to about 60 before Phase I winds up in October and the team returns to San Diego to begin detail design.

Principal people on-site at RI's Space Division include Lloyd Munson, orbiter midfuselage deputy program director and chief engineer; and George Theilacker, Jack Jensen, Ed Hansard and Lee Weikum, engineering supervisors. Ralph Mulroy is handling production and Carl Pereira heads quality control.

Convair was chosen by RI to design and fabricate eight aluminum midfuselage sections for the shuttle orbiter. Each midfuselage section will be 62 feet long, 17 feet wide, 13 feet high and will weigh approximately 12,400 pounds. Three of the sections will be used for ground testing and five are planned as flight articles.

## Convair Moves Office For Shuttle External Tank Project to FW

Convair Aerospace Division has moved its program office for the space shuttle external fuel tank project from San Diego to Fort Worth. A. B. Cox remains as program director.

Convair is teamed with The Boeing Co., prime contractor, which submitted a proposal for the external tank program May 17. Chrysler Corp., McDonnell Douglas and Martin Marietta Corp. also submitted proposals.

NASA is expected to announce a contract winner by August 1.

Should Boeing win the contract, most of the manufacturing work by Convair would be done at Fort Worth, with considerable critical support from San Diego. Assembly of the tanks is to be carried out at NASA's Michoud Assembly Facility near New Orleans.

The current NASA schedule calls for construction of three ground-test articles and six flight articles during the design, development, test and evaluation phase between August 1 and the end of 1978.

The production program is scheduled to extend from 1978 through the life of the space shuttle program. Initial production calls for a total of 439 tanks through 1988 valued at more than \$1 billion.

E. B. Maske is deputy program director and chief engineer on the external tank project.

### Awards Due June 21

Convair Aerospace Division President Frank W. Davis will speak and present cost-reduction and quality awards at the Management Association meeting in Fort Worth June 21.

## S-C Matrix to Be Key Factor in DATRAN Communications Chain

Stromberg-Carlson Corp. is completing manufacture of a new solid-state switch matrix which will be a key element of a nationwide digital data communications network for DATRAN, a subsidiary of the University Computing Co.

The DATRAN network is slated for completion by 1975. It will be the only nationwide public system for transmitting switched, highspeed, digital computer and other data messages.

The matrix is a collection of switches which permits calls to be directed to or from any point in the DATRAN network. The network permits over 16,000 data calls to be made simultaneously. It occupies fewer than six square feet of floor space,

and all components are housed in an eight-foot-high equipment bay.

S-C has already produced two engineering test matrices and is now under a \$1.9 million contract to produce seven additional models.

The prototype matrix is scheduled to be installed in DATRAN's Vienna, Va., facility in October. Additional production matrices will be installed later at various other sites in the DATRAN network.

Glenn E. Penisten, president and chief executive officer of DATRAN,

## Review for AMAVS Staged at Fort Worth

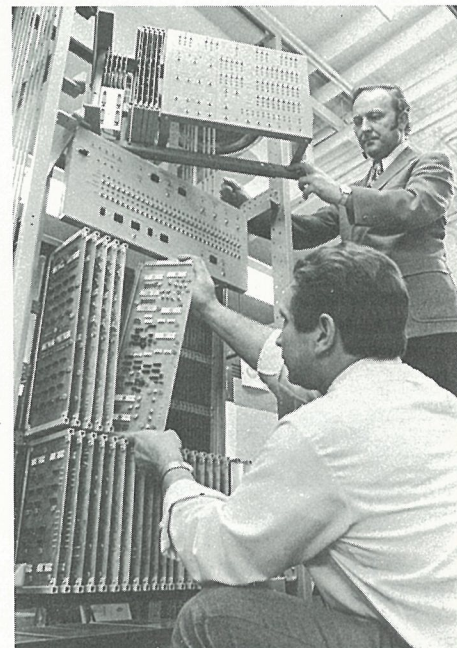
About 200 technical representatives from government and industry attended a two-day Advanced Metallic Air Vehicle Structure Design Review at Convair-Fort Worth operation May 1-2.

Under the AMAVS program, sponsored and jointly managed by the Air Force Flight Dynamics Laboratory and the Air Force Materials Laboratory, Fort Worth has a \$11.6 million contract to design and build a wing carrythrough structure for movable wing aircraft.

"Our goal is to use new materials and techniques where possible, and at the same time keep weight and costs down," said Clarence Hart, program manager.

The contract was awarded in 1971 and is scheduled to be completed in 1976.

Specifications call for the carrythrough structure to be 25 feet long, six feet tall and five feet wide. Fort Worth will also build the structure in which the unit will be tested.



**NEW SWITCH** — A prototype solid-state switch matrix from Stromberg-Carlson Corp. will become a part of the nationwide data transmission network operated by DATRAN. Barrie Brightman, manager of digital switching system development, above, checks progress as William Stewart, engineering supervisor, inserts a modular circuit board.

said, "The achievements of S-C and DATRAN engineers represent innovations for data communications users. The S-C solid-state matrices, which are unique to DATRAN, have additionally permitted DATRAN to reduce its switching physical plant costs by \$20 million as a result of the application of . . . solid-state switch technology."

## Paper Is Coauthored By FW Test Pilots

Neil Anderson and Dave Thigpen, engineering test pilots from Convair-Fort Worth, are coauthors of a technical paper presented at the annual spring meeting of the Society of Experimental Test Pilots in San Diego.

The paper, "F-111 Flight Test with Stall Inhibitor System," was given at the April 27 technical session chaired by J. G. Basquez of Convair-San Diego.

Others from General Dynamics attending the three-day meeting included Frank W. Davis, Convair Aerospace Division president; Howie Auten and Ed Emerson, Convair-San Diego test pilots; Lyman C. Josephs, vice president-program director YF-16 lightweight fighter prototype program; and D. B. Scheideman, YF-16 director of contracts, plans and program control.



**ON TARGET** — Standard Active surface-to-surface missile leaves launcher in first firing to seek and engage a target ship over the horizon. The missile scored a direct hit and penetrated deep into the target ship's hull.

## 'Objectives Met' on First Standard Active Flight

Pomona Division's new variation of the Standard Missile successfully used the active radar guidance system to seek and engage surface targets over the horizon in its first flight.

The first Standard Active surface-to-surface missile (SSM) flight was made at the U. S. Navy's Pacific Missile Range April 7. The missile was launched from the USS *Hoel*, a Navy combatant, against a target ship slightly over the horizon. This marked the Navy's initial use of an active guidance section in a surface-to-surface application.

Ralph E. Hawes, Standard Active (SSM) program manager, said, "After launch from the *Hoel*, the Standard Active acquired and guided on the target ship *Ingersoll*, impacting the target in the forward superstructure and penetrating deep into the target ship hull. All test objectives, from launch to impact, were met."

The new weapon utilizes the airframe of the surface-to-air Standard Missile-1, now in production at Pomona, and a sophisticated guidance section made up of a radome, seeker head, shroud, an active radar sub-

system, logic and control assemblies, and a guidance computer. A major new element of the system is the CMDR (coherent monopulse doppler radar) built by the Raytheon Missile Systems Division under subcontract to General Dynamics.

Standard Active can be fired from guided missile launch ships currently in the inventory, with minimum modification to the existing shipboard launch systems. It is 10 inches longer and approximately 100 pounds heavier than the Standard Missile-1.



**TOP PERFORMANCE** — Photo of two airborne CL-84s was taken outside of Canadair Limited plant. The CL-84 at left, flown by Royal Air Force F/Lt. Rod Ledwidge, recently executed a transition from conventional flight at 150 knots to full hover on instruments at Patuxent River, Md. This is believed to be the first time a V/STOL aircraft other than a helicopter has performed this feat.

## COWEN AND HORNUNG ARE APPOINTED TO CORPORATE FINANCIAL POSITIONS

Philip R. Cowen has been appointed director-financial planning and control for General Dynamics, and Edward J. Hornung has been named director of corporate accounting.

The appointments were announced by Executive Vice President, Finance, Gordon E. MacDonald.

Cowen, who had been director of corporate accounting since 1970, will be responsible for coordinating and supervising corporatewide financial planning and reporting activities,



**Philip R. Cowen**

Cowen, a native of New York City and a graduate of New York University, joined General Dynamics in 1970 after six years' service with Arthur Andersen & Co. When he left that company, Cowen was an audit manager in its New York office.

Hornung, who is also assistant treasurer of the company and who will continue to have responsibilities in that area, will be responsible for coordination and supervision of the accounting policies and practices of the company and for preparation of external financial reports.

advising corporate management of all developments that affect the financial well-being of the company and for financial analysis of capital and lease appropriation requests.

Hornung, a native of New Jersey, also is a graduate of New York University. He joined

General Dynamics in 1955 at its corporate headquarters as an accounting staff supervisor and held a number of positions before being named assistant treasurer in 1966. At the time he joined General Dynamics, Hornung was assistant to the controller at Clinton Foods, Inc., in New York City.



## Demand Is Leading To Facility Expansion At Three S-C Plants

Heightened demand for Stromberg-Carlson telecommunications products has spurred expansion of the company's manufacturing plants in Sanford, Fla., and Charlottesville, Va., and of fabrication facilities at Rochester, N. Y.

Work is under way on construction of a 164,000-square-foot addition to the S-C plant in Sanford, main production facility for CROSSREED electronic switching systems.

The S-C plant at Charlottesville is being enlarged by 104,000 square feet, with most of the space to be used for increasing the output of molded plastic telephone parts.

A number of Rochester operations are being enlarged to meet demand for key components and subassemblies. Major capital expenditures are being made for expansion and modernization of printed wiring board fabrication facilities.

Production of sealed reed switches is also being increased in Rochester with the addition of a second clean room plating facility.

## F-111Fs Praised for All-Weather Effort in Exercise

"Fifty percent of the time our aircraft were the only ones flying because of bad weather . . . There were thunderstorms as bad as I've seen since Southeast Asia, and those guys were still doing their jobs."

This is the way Lt. Col. Ronald J. Crozier, squadron operations officer of the 389th Tactical Fighter Squadron at Mountain Home Air Force Base, Idaho, described his unit's performance in "Exotic Dancer VI," a military exercise held recently in North Carolina.

The exercise involved about 42,000 men from the Army, Navy, Marine Corps and Air Force.

Twenty F-111Fs of the 389th, operating from Eglin Air Force Base, Fla., flew 137 sorties during the exercise "without a miss."

"We flew according to the standard (weather) minimums used here," Colonel Crozier said. "The main thing that stopped other aircraft was the weather over the target area."

"Minimums were below 500 feet

★ ★ ★

## F-111D Is Successful In Fort Hood Debut

F-111D aircraft from the 522nd and 524th Tactical Fighter Squadrons at Cannon Air Force Base, N. M., carried out their roles to near perfection in "Gallant Hand '73," a military training exercise staged recently at Fort Hood, Tex.

The F-111D units executed all 62 assigned sorties exactly on time and on target, Col. William L. Strand, Cannon's deputy commander for operations, revealed. "As far as I can determine," he said, "we were the only unit to accomplish the total mission with this degree of precision."

The tactical missions carried out by the F-111Ds were night, low-level sorties.

Noting that this was the first exercise for the "D" model, Colonel Strand said, "Our appearance in Gallant Hand was a public unveiling of the versatile aircraft . . . this should just be the start of what we are confident will be a long and illustrious career for the F-111D."

and we were still flying without missing. All other aircraft stopped flying when minimums reached below 2,500 feet.

"One positive aspect of the weather was that we had the sky all to ourselves."

He added that maintenance people did a great job under "terrible conditions."

"This is one of the best performances I have observed," Maj. Gen. Woodward E. Davis Jr., commander of the Air Force during the exercise,

said in a letter to Lt. Col. James R. Arthur, detachment commander F-111F squadron.

General Davis added: "The all-weather capability of the F-111F was demonstrated when your unit repeatedly completed successful missions in weather conditions which caused cancellation of flights by all other fighters . . . Your maintenance and support personnel should be particularly proud to have completed every sortie with no maintenance cancellations."



**MEMORIES** — Maj. Reuben H. Fleet, left, founded Consolidated Aircraft Corp., forerunner of Convair Aerospace Division, on May 29, 1923, at East Greenwich,



R. I. The following year, the company moved operations to the above plant in Buffalo, N. Y. The move to San Diego was made in 1935.

## Convair Looks Back on Half Century of Progress

(Continued from Page 1)  
years). As war approached in 1939, the Army asked Consolidated to design a strategic bomber. By the end of 1940, just nine months after contract award, the famed B-24 Liberators were in production.

In 1941 Fleet sold his holdings in Consolidated. The mechanics of merging Consolidated with Vultee Aircraft were worked out the following year and in March, 1943, the marriage took place when Consolidated Vultee Aircraft Corp. was legally formed. Convair quickly cropped up as a nickname and was retained when General Dynamics took control in 1953.

A facility in Fort Worth was completed in 1942 to meet the production demands for the B-24 Liberator that was to become the most heavily pro-

duced four-engine aircraft in the war. Fort Worth was to later produce 10-engine B-36s, the B-58, and now the F-111.

Convair firsts are many, notably the XF-92A, the world's first delta-wing supersonic jet; B-58 Hustler, first supersonic bomber; Sea Dart, first delta-wing seaplane; Tradewind, first turboprop water-based transport; Pogo Stick, first plane to take off and land vertically; and the F-111, first successful variable-sweep-wing aircraft.

Convair was to establish a solid reputation in rocketry also. In 1948 the company launched the MX-774, forerunner of the Atlas. When it became apparent that the size of the Atlas program would mushroom, the company formed the Astronautics Di-

vision, and a new plant was built on Kearny Mesa in San Diego. Atlas was chosen by NASA as the booster for its Mercury program. The Atlas boosted John Glenn and his Friendship 7 spacecraft into orbit in 1962. From Atlas technology came Centaur, the world's first hydrogen-fueled space vehicle. Even more sophisticated vehicles are being planned.

Maj. Fleet was guest of honor at a recent Convair 50th anniversary dinner-dance in San Diego.

In marking the 50th anniversary of its founding, Convair employees can hold their heads high, proud to be a part of a continuing tradition of excellence associated with the Convair name and in keeping with a Reuben H. Fleet motto: "Nothing short of right is right."

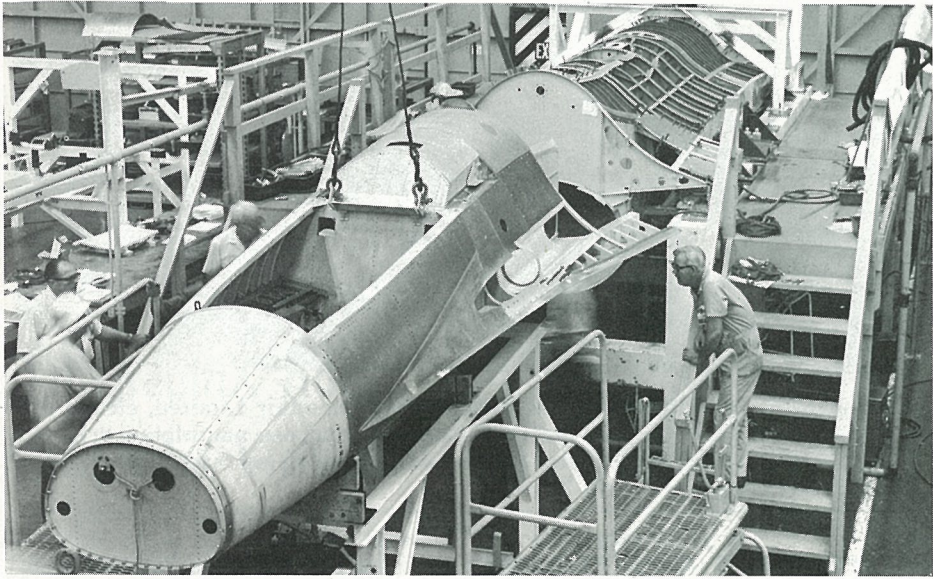
# General Dynamics World

Vol. 3, No. 4

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GENERAL DYNAMICS CORPORATION

July 1973



**MILESTONE** — Forward and aft fuselage sections of the YF-16 lightweight fighter prototype aircraft are mated at Convair-Fort Worth.

## YF-16 Fuselage Sections Are Mated at FW

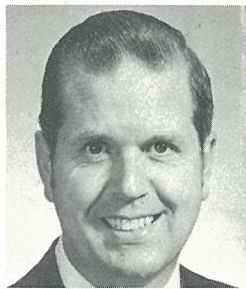
General Dynamics recently mated the forward and aft sections of the fuselage for the first of two YF-16 lightweight fighter prototype aircraft being developed for the U.S. Air Force.

These were the first sections of the airframe for the low-cost, high-performance aircraft to be joined. Final assembly of the first YF-16, including installation of aircraft systems, is scheduled to begin in August and continue through October.

## Grant Hansen Named VP-General Manager At Convair-San Diego

Grant L. Hansen has been named vice president and general manager of Convair-San Diego.

Hansen had been Assistant Secretary of the Air Force for research and development since March, 1969. His



resignation was accepted with regret by President Nixon, the White House announced. "We are very pleased that Hansen has rejoined General Dynamics to head the company's important commercial aircraft and space program activities," Chairman and Chief Executive Officer David S. Lewis said.

Hansen was with Convair-San Diego from 1960 to 1969. He joined the company as chief engineer-design, and in 1962 he was named program director for the Centaur high-energy upper-stage launch vehicle. He became vice president of launch vehicle programs in 1965.

## GD, Arcata Agree To Purchase by S-C

General Dynamics and Arcata National Corp. of Menlo Park, Calif., have signed a definitive agreement for the purchase by Stromberg-Carlson Corp. of Arcata Communications, Inc., and Arcata Leasing Corp.

Under terms of this agreement, the closing date was June 22, 1973. The price was not disclosed.

The new subsidiaries will become a part of General Dynamics' communications systems operations, along with Stromberg-Carlson. The companies will continue to operate under their present managements.

"This first mating is a significant milestone in our lightweight fighter program," said Lyman C. Josephs, Convair Aerospace Division vice president-YF-16 program director. "It represents an all-out effort by a dedicated YF-16 team."

The forward fuselage section is approximately 18 feet long, and the aft section to which it was joined is approximately 21 feet long. The nose radome will add three feet to overall fuselage length when installed.

After system checkouts and ground tests in November, YF-16 No. 1 is scheduled to be shipped in a C-5A aircraft to Edwards Air Force Base, Calif., in December to be prepared for its first flight in early 1974.

## Phalanx Blasts Aerial Target in First Firing

A prototype of Pomona Division's Phalanx close-in weapon system recently tracked and shot down an aerial tow target in its first firing at an airborne object at the U. S. Navy's Pacific Missile Range.

The firing was made from a motion simulator which reproduces shipboard conditions, said John E. McSweeney, Phalanx program director for Pomona. The test took place at San Nicolas Island against a target being towed by a Navy aircraft.

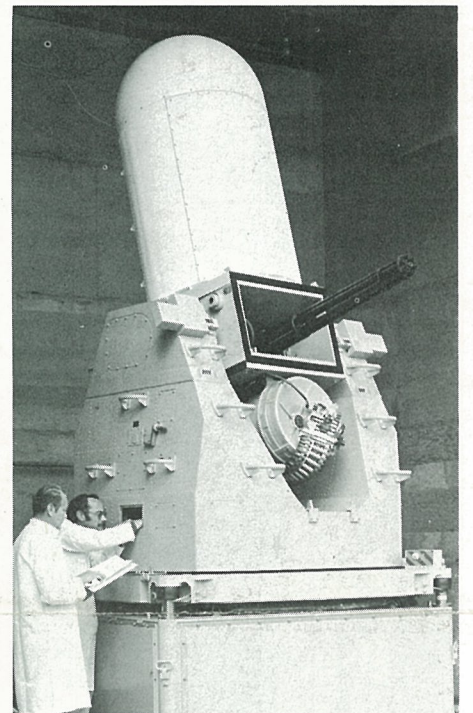
Phalanx is an automatic, computer-operated, rapid-firing gun system designed for shipboard use to protect

surface ships against attacks by cruise missiles or low-flying aircraft.

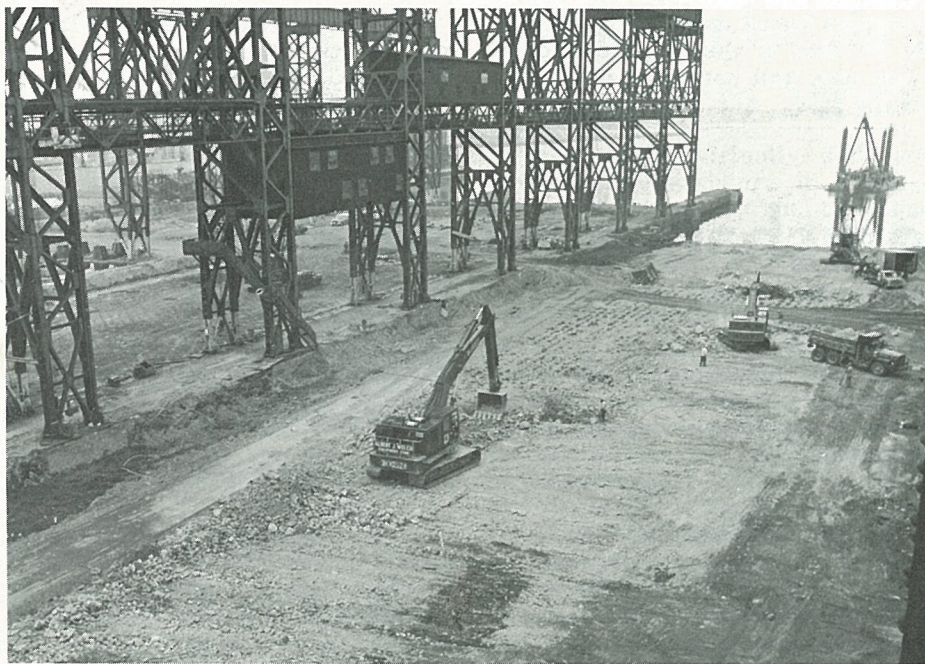
McSweeney said that Pomona has produced two Phalanx prototypes for the Navy. The prototype at San Nicolas will soon be installed aboard the USS King for shipboard test and evaluation firings. The other is at Pomona for operation and maintainability training of Navy personnel.

Designed as an integral system, the three-section, robot-like Phalanx combines fire control and gun mount into

(Continued on Page 2)



**PHALANX** — Technicians at Pomona Division adjust Phalanx close-in weapon system prototype before shipment to San Nicolas Island. The rapid-firing gun system, attached to a motion simulator, successfully shot down an aerial tow target in its first firing at an airborne target.



**CONSTRUCTION** — Heavy equipment is used to begin excavation for two new shipbuilding basins at Quincy Shipbuilding Division, where liquefied natural gas tankers and other large ships can be built. Each basin will be 900 feet long and 152 feet wide. Slab floors will be 12 feet below mean low water.

### End of Sliding Ways

## Major Construction Contract Is Awarded For Two Shipbuilding Basins at Quincy

General Dynamics has announced the award of a multimillion dollar contract to Perini Construction Co. of Framingham, Mass., for the construction of two shipbuilding basins at its Quincy Shipbuilding Division.

P. Takis Veliotis, president and general manager of Quincy, in making the announcement, said, "These basins will be similar to our three existing building basins and will allow us to compete effectively in today's market as well as future markets, not only for liquefied natural gas tankers

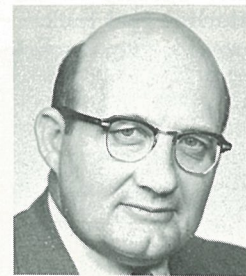
but also for other ships of comparable size."

General Dynamics has contracts for \$270 million to construct three LNG ships and is currently negotiating with several companies for additional contracts.

Conversion of the shipways will mark the end of sliding-type launchings at Quincy shipyard. Future ships will be floated out of the basins instead of going down sliding ways into the water.

## Massey Assumes Role Of Director for GD's Data Processing Unit

Charles L. Massey has been appointed director of data processing for General Dynamics.



Massey, who had been controller at Convair-San Diego since 1970, will be responsible for corporate and operating units' data processing needs.

In announcing the appointment, Chairman and Chief Executive Officer David S. Lewis also said that data processing functions now being performed by individual operating units of the company will be consolidated wherever appropriate to achieve more efficient and effective use of resources.

Massey, a native of Fort Worth, joined the company in 1951 at Convair-Fort Worth and served there until 1967, when he was assigned to the corporate office as manager of financial analysis. In 1968 he was named corporate director of financial planning and analysis.

He received a B.S. degree in 1949 from Texas Christian University.

## Six F-111C Aircraft Delivered to Royal Australian Air Force at Base Amberley

Six F-111C aircraft joined the Royal Australian Air Force June 1 following a formation ferry flight from McClellan Air Force Base, Calif., to RAAF Base Amberley near Brisbane.

A total of 24 F-111Cs manufactured at Convair-Fort Worth is scheduled to be delivered to the RAAF by November.

The F-111C aircraft are undergoing a modernization and refurbishment program at Fort Worth before being flown to McClellan by RAAF crews, who receive further aircraft orientation before the ferry flights.

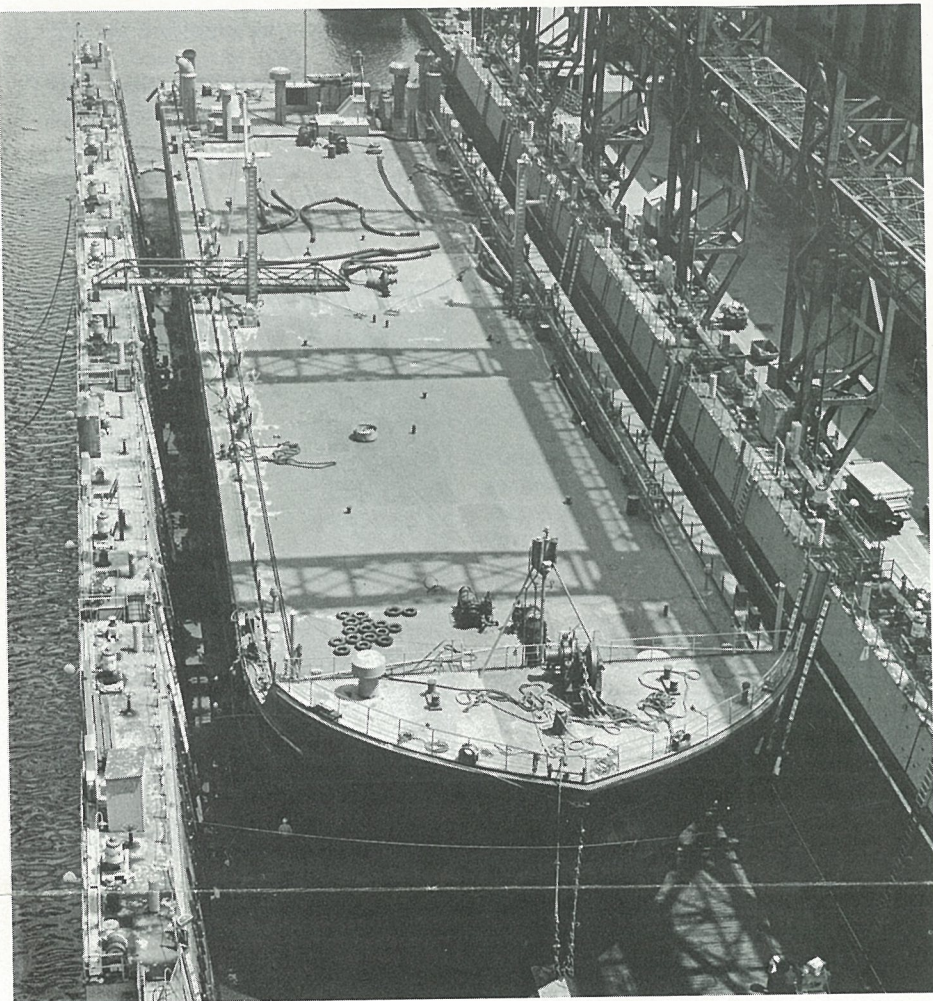
Flights to Australia are being made in groups of six aircraft. Additional ferry flights are slated to be made in July, September and November.

The first contingent of F-111Cs departed McClellan May 28, making stops at Hickam Air Force Base, Hawaii, and Pago Pago, Samoa, before touching down at Amberley.

On hand to greet RAAF crews were Minister of Defence Lance Barnard, Secretary of the RAAF Fred Green, Chief of the Air Staff Air Marshal Charles Reed, and Air Vice Marshals James Roland and Keith Hennock.



CL-215 PANEL — Romeo Boyer, Dept. 130 at Canadair Limited, cleans aft fuselage panels for the Canadair CL-215 multipurpose amphibian prior to chemical milling, an inexpensive method of producing surfaces to extremely close tolerances.



REPAIRS — *Irving Sealion*, a large transport barge operated by a subsidiary of Irving Oil Co. of Canada, is in dry dock at Quincy Shipbuilding Division for repairs. The barge is 360 feet long and normally serves the Gulf of St. Lawrence.

## Pomona's Phalanx Tracks, Blasts Aerial Tow Target In First Firing

(Continued from Page 1)

a single structure. Precision pulse doppler search and track radars are housed in the upper radome. The mid-section contains a six-barrel Gatling gun and magazine, and the base is composed of a barbette with electronics module.

Overall, the system is approximately 15 feet high, weighs 11,000 pounds, and requires only 58 square feet of deck space.

Tracking begins immediately when Phalanx's acquisition radar locks on to incoming enemy targets. During tracking, the 20-millimeter cannon follows the target and begins firing automatically when the intruder comes within range. Incorporated into the system is an electronic spotting technique which measures the angular error and feeds the information back into the network to correct the gun's aim.

Phalanx maintains continuous automatic alert, although it can be overridden by an operator. Its functions of acquisition, tracking, firing, spot-

ting and disengaging are carried out by commands from the system's computer.

The rapid-fire system uses a Pomona-developed 20-millimeter bullet which produces high-penetrating power and great impact on the target to inflict more damage than standard ammunition.

The Phalanx is expected to be installed aboard many high-value combatants, including escort ships, beginning in 1976. Cdr. John E. Paulk is director of the program, which is under development cognizance of the U. S. Naval Ordnance Systems Command.

## Gabriel Is Appointed To Controller Position

Richard M. Gabriel has been appointed controller of Freeman Coal Mining Co. and The United Electric Coal Companies, subsidiaries of Material Service Corp.

Gabriel succeeds Jerry C. McMurrey who was recently promoted to vice president-finance for Material Service.

The promotion of Andrew Czornij to assistant controller and William Lotz to chief accountant of the firms was also announced by Frank Nugent, president of Freeman Coal and United Electric.

Gabriel, formerly assistant controller, joined the coal companies in 1965 in the accounting department. He received his M.B.A. degree from De Paul University in Chicago and is a Certified Public Accountant.

Formerly chief accountant, Czornij began with the coal companies in 1967. He holds a B.S. degree from De Paul and is currently completing his M.B.A. at the same school.

Lotz is also completing his M.B.A. at De Paul, where he received his B.S. degree with a major in accounting. He joined the accounting department of the companies in 1968.

Freeman Coal and United Electric Coal together rank among the top 10 coal producers in the United States. Each company operates three mines in Illinois.

## Successfully Flight-Tested

## GD Makes Detachable F-4 Recon Pod

Convair-Fort Worth has developed and successfully flight-tested a detachable pod designed to provide a reconnaissance capability to nonreconnaissance versions of the F-4 aircraft.

The 28-foot-long pod attaches to centerline hooks normally used for suspension of a 600-gallon fuel tank. An F-4 equipped with the pod can achieve the same flight performance, including supersonic speeds, as an F-4 carrying a centerline fuel tank.

"Using the pod would give the F-4 operator greater assurance that the mission would be flown on schedule," said V. Dolson, director of special projects. "The pod would also give F-4s a reconnaissance capability at a fraction of the cost of a reconnais-

sance aircraft itself.

"For example," he said, "a reconnaissance aircraft can be grounded for aircraft maintenance or for sensor maintenance, where the pod can be installed in less than 45 minutes on any operational F-4. The pod provides operational flexibility and multiple-mission capability."

The pod is capable of carrying a variety of reconnaissance sensors across the electromagnetic spectrum, including electronic countermeasures, sidelooking radar, infrared, and optics. It has proven to be structurally and aerodynamically compatible with the F-4.

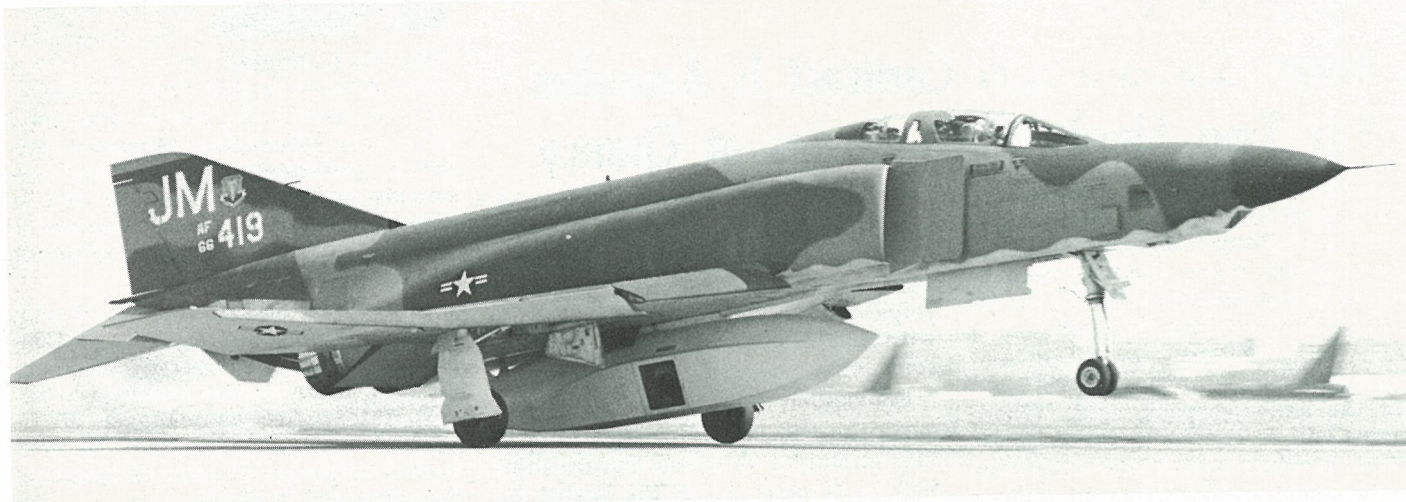
Provisions in the aircraft include a small removable control panel located in the aft cockpit. The aircraft carries

a harness which stays with the airplane, and modification of the aircraft to accept the pod can be done in less than three days.

The pod, weighing 1,515 pounds empty, features a machined aluminum structure covered with an aluminum skin. Nose and tail cones are of laminated glass fiber.

Large access doors are provided for installing and removing the sensors. Ground support equipment for the pod consists of an installation dolly only. The dolly is built low to the ground so the airplane does not have to be jacked to install the pod.

The reconnaissance pod has a built-in self-test capability and is a completely contained intelligence-gathering system.



RECON POD — A detachable pod which provides reconnaissance capability to nonreconnaissance versions of the F-4 aircraft is shown during flight testing at Fort Worth. The pod has a built-in test capability.

## Holiday Slated July 4

Independence Day will be a holiday for General Dynamics personnel at all United States divisions and subsidiaries.

Company facilities will be closed July 4 and, except for those required to perform security and maintenance assignments, employees will have the day off.

Regular work schedule will resume July 5.

## Three Executive Positions Filled at Stromberg-Carlson

Stromberg-Carlson has announced appointment of Edward E. Lewis as plant manager-Camden, Dr. Richard W. McGuire as corporate facilities planner and Earl I. Roberson as director of Rochester operations.

Lewis joined S-C in 1962 as an equipment engineer at the Charlottesville, Va. plant. He transferred to the Camden plant in 1967 as engineering manager and served most recently as production manager. He is a graduate of the State University of New York, where he received an associate degree in mechanical technology.

Dr. McGuire joined S-C from Electric Boat Division, where he had been a management systems specialist since 1971. He joined Convair-San Diego in 1955 as an industrial engineer and held positions in facilities planning and project management. In 1968, he transferred to Charlottesville as materials manager.

He received a bachelor's degree from Mississippi State College, an M.S. in industrial engineering from the Georgia Institute of Technology and a Ph. D. in industrial engineering from Ohio State University.

Roberson joined S-C in 1953 as an accountant and budget analyst. For the past 15 years he has held various production management positions, serving most recently as manager of production fabrication. He is a graduate of the Rochester Business Institute.

## DatagraphiX Adds Microfiche Viewers

Stromberg DatagraphiX has added two microfiche viewers with extended fiche carriers to its line of computer-output-microfilm equipment.

The Model 1401 will accept microfiche up to 12 inches in length. The compact unit is easy to operate, requires minimum maintenance and is equipped with a 9-x-11½-inch non-glare acrylic screen.

The Model 1451, which offers the same design and performance features as the 1401, accepts either a single 12-inch fiche or two six-inch fiches. The 1451 offers a 12-x-15-inch screen capable of displaying an image seven percent larger than the original document.

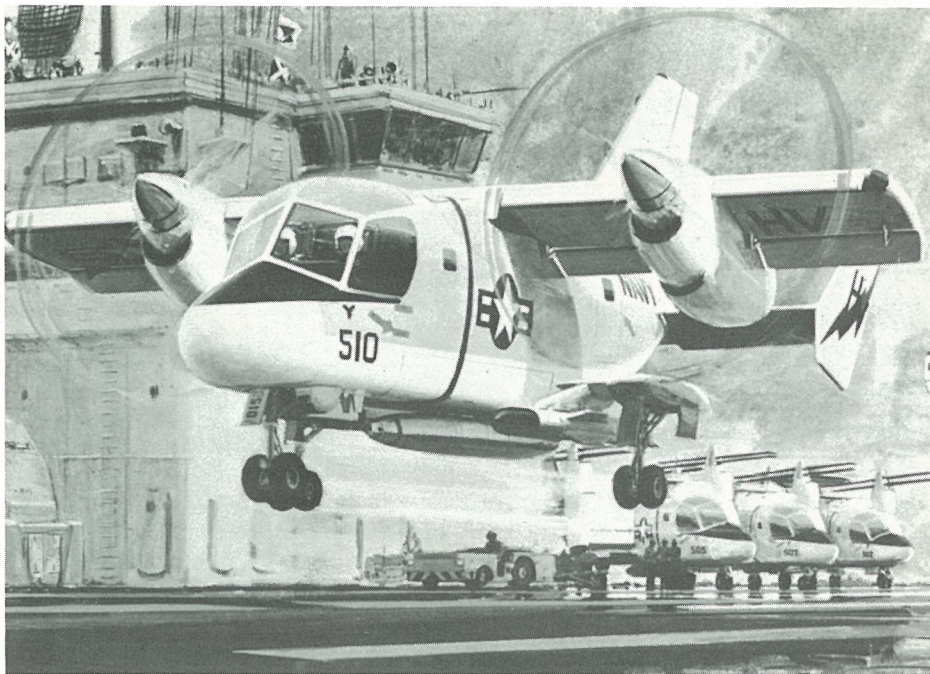
Standard lens choices are 24, 42, and 48-power and they are interchangeable.

## GD Proposes

Convair-San Diego has submitted a proposal to the Naval Air Systems Command for a highly advanced and larger version of the Canadair-developed CL-84 tilt-wing V/STOL aircraft which would operate from the Navy's proposed Sea Control Ships.

The aircraft is designated Model 84. It has been designed to provide the Navy with a high-performance long-range sensor carrier to operate from Sea Control Ships and in other operations that may require vertical and short takeoff and landing capability.

The proposal calls for building four aircraft—two performance models and two configured for antisubmarine



**ADVANCED VERSION** — Drawing depicts Navy antisubmarine warfare version of Convair-San Diego's proposed Model 84 as it lifts off Sea Control Ship. Tilt-wing technology pioneered by Canadair Limited for its CL-84 is being applied to the larger, highly advanced Model 84.

## Advanced CL-84 Aircraft

warfare missions. Test articles for static testing are also proposed.

The twin-engine aircraft hovers and makes vertical takeoffs and landings using the propulsive lift from two large-diameter propellers.

The aircraft can take off with payloads far in excess of its vertical lift capability by making a short carrier deck run with the wing tilted to an intermediate position. The aircraft then climbs with the fuselage in a level attitude, giving the pilot excellent visibility.

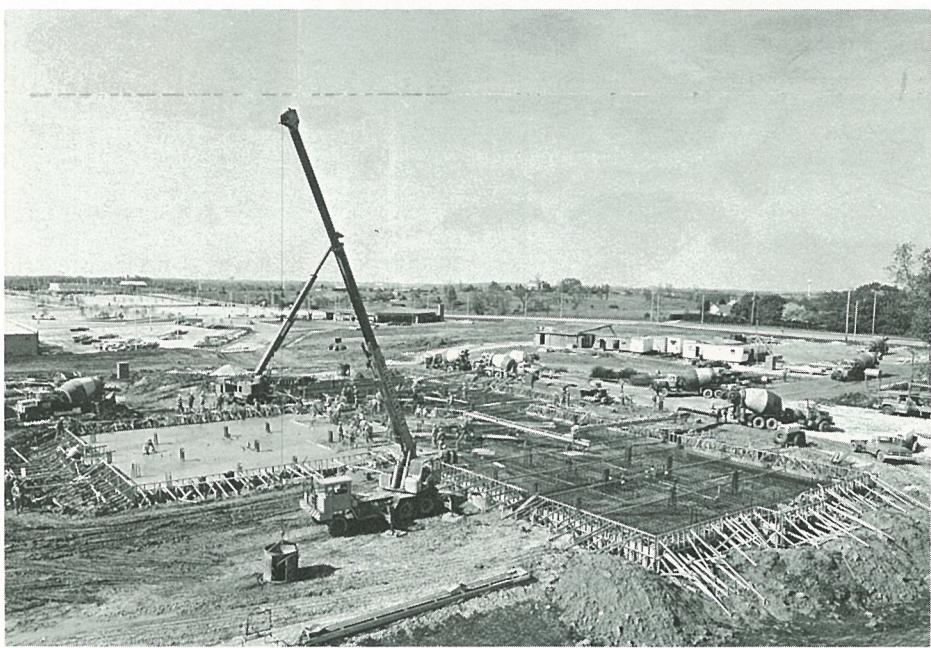
In addition to the vertical takeoff and hover capability, the Model 84 features high speed and ceiling, long range and endurance, and fixed-wing-aircraft ease of operation.

Other proposed versions include air and surface surveillance, antiship missile defense, search and rescue, utility transport, vertical carrier on-

board delivery and the medium assault transport for the U. S. Marine Corps. The basic Model 84 airframe is essentially common to all versions.

San Diego's proposed growth version of the CL-84 incorporates proven tilt-wing technology pioneered by Canadair Limited. The U. S., Canada and the United Kingdom are currently participating in a tripartite program at Patuxent River, Md., using a CL-84 aircraft. The program is aimed at determining the instrument landing requirements for V/STOL aircraft that would operate from Sea Control Ships.

The aircraft in the tripartite program recently made what is believed to be the first fixed-wing transition from level flight to full hover under simulated instrument conditions during the joint testing at the Patuxent River Naval Air Test Center.



**BIG DAY** — Material Service Corp. Redi-Mix trucks (background) deliver concrete to the new Yorktown Apartments project in Lombard, Ill. More than 2,100 cubic yards of concrete—one of the largest one-day pours in Material Service's history—were delivered in a 10½-hour period.

## Material Service Delivers More than 2,100 Cubic Yards of Concrete in 10½-Hour Period

Material Service Corp., in one of the largest one-day pours in its history, delivered more than 2,100 cubic yards of concrete in 10½ hours to the new Yorktown Apartments in suburban Lombard, Ill.

Thirty-five Redi-Mix trucks delivered the concrete from Material Service yards in neighboring Clarendon Hills, Naperville, Cloverdale and Bensenville, Ill.

As each of the trucks arrived at the site, its load was poured onto conveyors located at several different points. The conveyors then directed the flow of material simultaneously to work crews at various locations of the foundation.

The concrete was used to form the base slab for the 15-story high-rise. The slab ranged between two and a half feet and five feet in thickness. The continuous pouring technique was necessary to assure that the massive foundation would be monolithic throughout.

The project is being built by Miller Builders, Inc., Skokie, Ill., with Toney Construction Co., McHenry, Ill., as concrete contractor.

## SD Wins DSA Honor

Employees of Convair-San Diego have received the Defense Supply Agency's highest award for continued outstanding performance in producing quality products.

The DSA Performance Improvement, Sustained Craftsmanship Award was presented by Brig. Gen. Jonah Lebell, USAF, commander of the Defense Contract Administration Services Region, Los Angeles, to Frank W. Davis, president of Convair Aerospace Division.

It was an unprecedented fourth Sustained Craftsmanship honor for Convair, making it the only company in the nation to have received the award that many times.

## Building Destroyed

### Stromberg-Carlson Switching System Is Returned to Service 24 Hours After Blast

An explosion virtually destroyed the telephone exchange in Promise City, Iowa, recently, but telephone service was halted for only 24 hours.

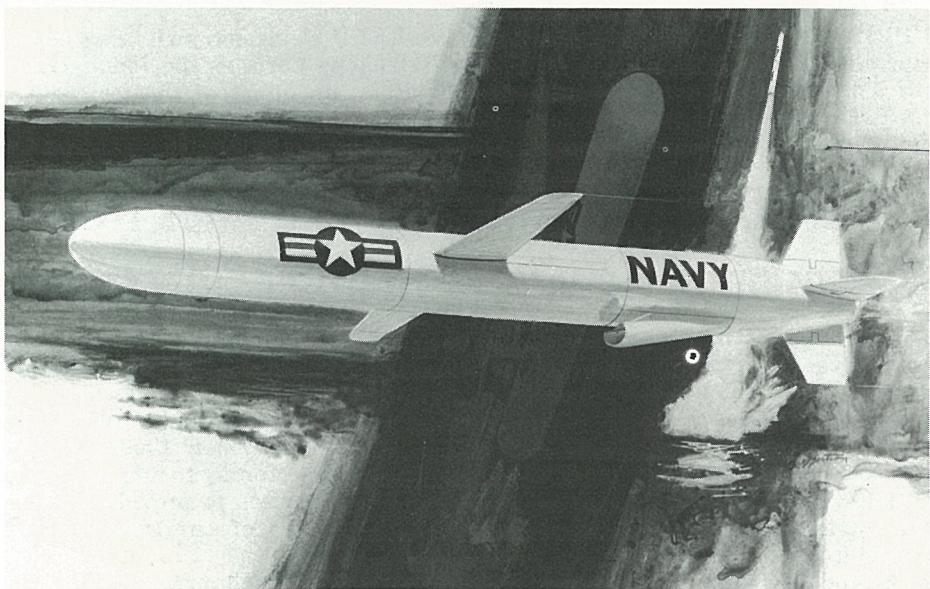
The blast, blamed on a malfunctioning propane gas heater, blew the roof straight up and then straight down—on top of the Stromberg-Carlson switching system inside.

Crews from Continental Telephone Service Corp. hoisted remains of the roof from atop the XY equipment frames and erected a tent to protect switchgear from the elements. Using jacks and hand winches, they bent the twisted steel frames to more or less upright positions.

Repairmen then cleaned switches and relays, attached loosened wires and installed a power supply to replace the shattered batteries. Local phone service was restored in one day and toll service resumed two days later.

The tent was replaced with a temporary frame building erected around the functioning XY equipment. Construction of a new exchange building was then begun nearby and a new 80-line, 300-terminal XY switching system ordered for installation.

S-C put the Promise City order on priority status and the equipment was delivered in just 11 weeks.



**UNDER STUDY** — Submarine Launched Cruise Missile (SLCM) being studied for the U. S. Navy by General Dynamics is shown in artist's drawing. This configuration resulted from design study contract awarded last year by the Naval Air Systems Command to Convair-San Diego. Technical feasibility of the launch concept has been verified by scale model tests conducted in the company's underwater test facility.



**WINNER** — Convair President Frank W. Davis, left, recently accepted for Convair-San Diego the Chairman's Award for division with best safety record in 1972 from Vice President, Industrial Relations Algie A. Hendrix. Quincy Shipbuilding Division and Convair-Fort Worth won awards for most improvement in safety performance last year.

## Electronics Operation in Orlando Awarded Contract for Terminals from Southern Co.

Electronics-Orlando was recently awarded a contract for 100 remote supervisory control terminals—with a possible follow-on of 112 more units—from the Southern Co. of Birmingham, Ala.

Southern is an electric utility holding company and the parent firm of Alabama Power, Georgia Power, Mississippi Power and Gulf Power. The company provides electric service to 2,150,000 customers located in an area of 120,000 square miles.

The remote terminal equipment provided by Orlando is housed in a single rack and performs supervisory control and data acquisition functions, as well as the processing of control signals for automatic generation control. The terminal has 50 control points and 90 status points.

General Dynamics won the design contract last October in a competition with General Electric.

### F-106B Refurbished

An F-106B owned by NASA's Lewis Research Center is being refurbished by Convair-San Diego under a \$65,000 contract.

During the 14-week renovation task, Convair will install hard points in the wings of the aircraft, allowing it to carry external pylons.

NASA-Lewis plans to use the two-seat, delta-wing aircraft as a chase and test plane for experiments in collecting supersonic transport data.

## Advanced Composite Part Manufactured by Machine

The first production aircraft parts made of advanced composite material on an automated tape-laying machine are being manufactured by General Dynamics.

The machine, for which General Dynamics holds a pioneer patent, is being used to turn out graphite fairings for the F-111 fleet at Convair-Fort Worth. The 41-by-21-inch fairings are placed under the wing pivot fittings to "blend" the wing skins into the fuselage.

Earlier this year, the first-of-its-kind machine was used to produce vertical and horizontal tail skins for the YF-16 lightweight fighter prototype.

The machine can lay up to 720 inches of composite material a minute. It can produce a piece as large as six feet wide, 30 feet long and eight inches thick.

"Because of the machine's speed and versatility, we can make the F-111 fairings of composite material at lower cost than if we produced the same piece from metal," said Bill Chitwood, senior design engineer.

The machine automatically rolls out the composite material in tape form, lays it to the desired size, and cuts it. Craftsmen then assemble and cure the component.

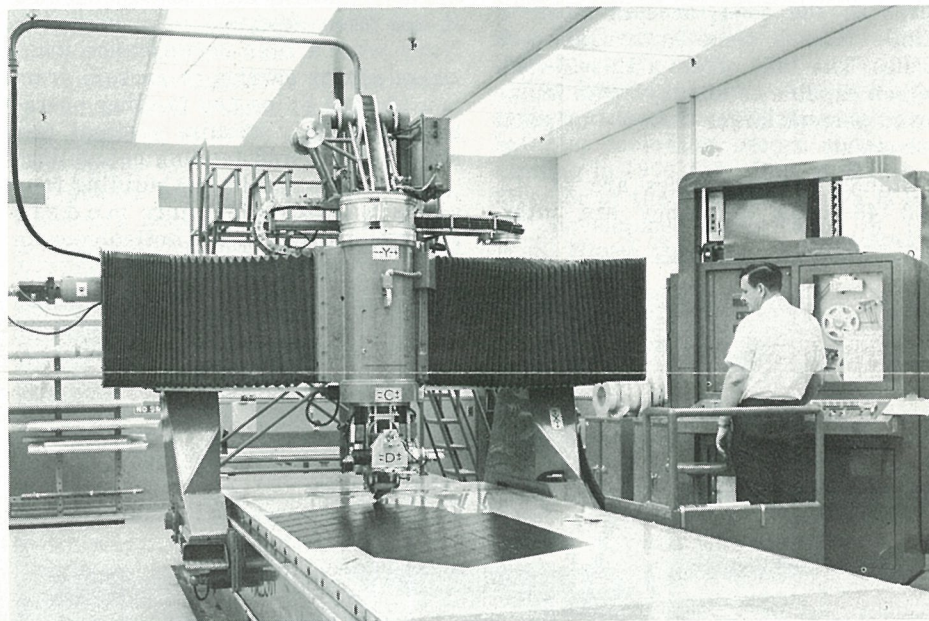
"A few years ago, composite parts were relatively expensive to make because of the high cost of raw material," Chitwood said. "Now that the cost of raw material has come down, the industry has got to reduce manufacturing costs. I think we've demonstrated our ability to do this on these programs."

## Pakistan Airlines Will Buy Series 30 DC-10s

Pakistan International Airlines will purchase three long-range, wide-bodied DC-10 Series 30 aircraft from McDonnell Douglas. This brings to 28 the number of customers selecting the DC-10 for their short, medium and long-range routes.

The first DC-10 is scheduled for delivery to PIA next February, the second next March and the third in March, 1975. The airline has an option to buy three additional DC-10 Series 30 aircraft during the 1976 to 1979 period.

Convair-San Diego builds the forward fuselage, overwing section and the aft fuselage under subcontract to McDonnell Douglas.



**AUTOMATIC** — Raymond Flow, Dept. 35, monitors automated tape-laying machine being used at Convair-Fort Worth to fabricate production aircraft parts of advanced composite materials.

### By 30 to 40 Percent

## GD Engineer Gets Patent for Irradiation Process to Strengthen Graphite Composite

A Convair-Fort Worth engineer has received a patent for a process to strengthen graphite composite material by at least 30 to 40 percent through neutron irradiation.

Ron Bullock, senior design engineer and former senior nuclear physicist, made his discovery while working in the company's nuclear-reactor complex.



**Ron Bullock** — "Graphite fibers have a unique molecular structure," Bullock said, "in that their atoms are arranged in layers, much like a deck of cards."

"A small percentage of the carbon atoms within the strong layers of graphite can be displaced into the spaces between layers by bombarding the material with neutrons from a nuclear reactor."

"These displaced atoms serve as an 'atomic glue' to bond the graphite layers together more tightly, thereby increasing the strength and stiffness of the irradiated material."

Regular advanced composites are as strong as conventional aircraft met-

als, yet lighter and stiffer. Irradiated graphite composites thus promise to be at least 30 to 40 percent stronger than existing aircraft metals—and about 20 percent stiffer.

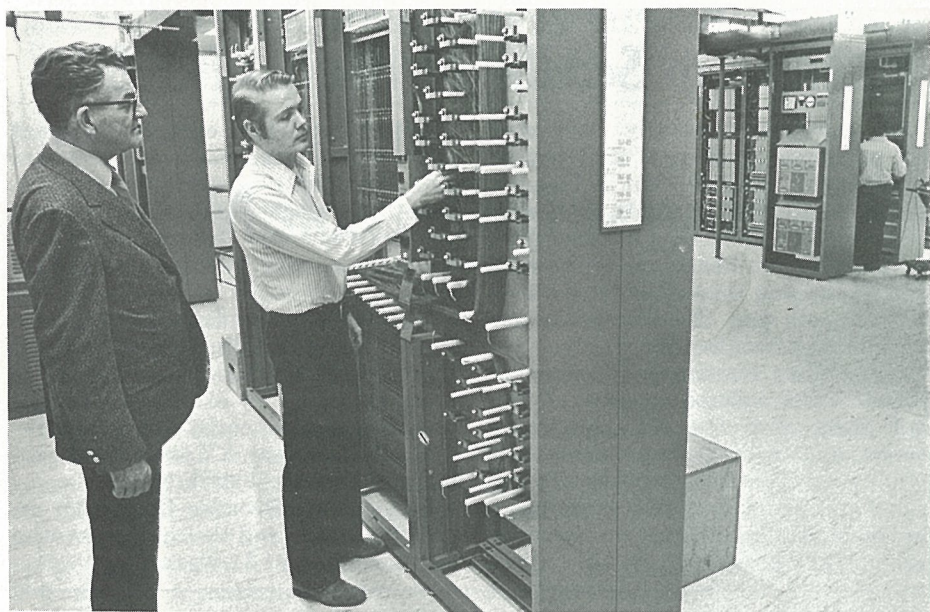
Graphite is one of several advanced composites used at Fort Worth to make aircraft parts. It is apparently the only one of the composites that gains strength through irradiation.

### Model Is Presented

General Dynamics has presented a scale model of the U. S. Navy's first submarine, the *Holland*, to the Holland Center in Liscannor, County Clare, Ireland.

The center and museum are being developed by the people of Liscannor, the birthplace of John Philip Holland, inventor of the submarine. Plans are to dedicate the facility August 12, 1974, the 60th anniversary of Holland's death.

Holland's firm, the Holland Torpedo Boat Co., was a forerunner of Electric Boat Division. His submarine was delivered to the Navy April 11, 1900, a date that annually is observed as the "submarine birthday."



**GROWTH** — A Stromberg-Carlson CROSSREED electronic switching center was selected by the Seneca-Gorham Telephone Corp. as the foundation of a 30-year growth plan. Charles F. Walters, president of the Holcomb, N.Y.-based telephone company, left, received a technical briefing from his company's chief engineer, Richard Hanscom, before the recent cutover.

## S-C Electronic Switching System Adds New Dimension of Service to Holcomb Subscribers

The Seneca-Gorham Telephone Corp. recently began using an all-new Stromberg-Carlson CROSSREED electronic telephone switching system to better serve its 1,500 exchange subscribers in Holcomb, N. Y.

It is the first fully electronic central office switching system to be placed in operation by an independent telephone company in western New York.

Charles F. Walters, president and general manager of Seneca-Gorham, said the new switching system can be expanded to serve up to 10,000 subscribers as the Holcomb area grows.

Walters said that Seneca-Gorham

expects the number of subscribers served by the Holcomb exchange to triple by 1985.

"Our new electronic switching equipment is extremely flexible, making it possible for us to add new features and services to provide for the changing needs of our subscribers," Walters said.

"Our new exchange building is large enough to hold any equipment additions we may need to meet service requirements through the year 2,000."

Seneca-Gorham has additional dial telephone exchanges in Honeoye, Rushville and Stanley, N. Y.